WEST Search History

DATE: Thursday, April 10, 2003

Set Name side by side	Query	Hit Count	Set Name result set
DB=USPT; PLUR=YES; OP=OR			
L9	L8 and l7	103	L9
L8	@ad<19990715	2862167	L8
L7	L6 and l5	136	L7
L6	bill$ near5 (period or cycle)	1852	L6
L5	L4 and l3	1365	L5
L4	(real$ adj3 time) near7 (bill$ or charge$ or charging or cost or calculat$ or estimat$ or comput$)	17404	L4
L3	L2 and l1	24700	L3
L2	(mobile or wireless or cell or cellular or hand) near7 (phone or telephon$) or telephon$ or phone	126875	L2
L1	telecommunication	45278	L1

END OF SEARCH HISTORY

WEST Search History

DATE: Thursday, April 10, 2003

Updated

Set Name side by side	Query	Hit Count	Set Name result set
	DB=USPT; PLUR=YES; OP=OR		
L16	L15 and l14	21	L16
L15	discount	3760	L15
L14	L13 and l12	53	L14
L13	(call$ near4 waiting) or 911 or (emergency near3 call$) or (three$ near5 call$) or tax	45093	L13
L12	L11 and l8	136	L12
L11	L10 and l2 and l6	152	L11
L10	(real$ adj3 time) near7 (bill$ or charge$ or charging or cost or price$ or pricing)	2688	L10
L9	L8 and L7	103	L9
L8	@ad<19990715	2862167	L8
L7	L6 and L5	136	L7
L6	bill$ near5 (period or cycle)	1852	L6
L5	L4 and L3	1365	L5
L4	(real$ adj3 time) near7 (bill$ or charge$ or charging or cost or calculat$ or estimat$ or comput$)	17404	L4
L3	L2 and L1	24700	L3
L2	(mobile or wireless or cell or cellular or hand) near7 (phone or telephon$) or telephon$ or phone	126875	L2
L1	telecommunication	45278	L1

END OF SEARCH HISTORY

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L14: Entry 2 of 53 File: USPT Apr 23, 2002

DOCUMENT-IDENTIFIER: US 6377938 B1
TITLE: Real time subscriber billing system and method

Abstract Text (1):
A system and method are provided for real time subscriber billing in a standard network routing path. Account information is stored for at least one subscriber. A determination is made, based on the account information, whether the subscriber has a sufficient balance for a desired service. Service is authorized or denied to the subscriber based on the determination.

Application Filing Date (1):
19970227

Assignee Name (1):
Real-Time Billing, Inc.

Assignee Group (1):
Real-Time Billing, Inc. Reno NV 02

Brief Summary Text (2):
The present invention relates to a system and method for real time subscriber billing. More particularly, the present invention relates to a system and method for real time subscriber billing in a standard network routing path.

Brief Summary Text (3):
There are a variety of methods for billing subscribers for services such as telephone, pay-per-view TV, Internet, water, gas, and so on. The most common method is to bill subscribers monthly for such services. When bills are based on usage, billing is usually performed after the service is used. Usage information is collected by a billing system, the amount to be billed is calculated based on the usage information, and bills are printed and sent to the subscribers once a month.

Brief Summary Text (4):
The usage information is typically collected by storing a Detail Use Record (DUR) in a temporary memory location in the equipment which monitors subscriber usage. In a telephone system, the DUR Memory is often located at an end office switch to which a subscriber line is directly attached. In an Internet environment, the DUR Memory is typically located at the server location or at the service provider. In a pay-per-view TV system, the DUR Memory is typically located at the subscriber location.

Brief Summary Text (5):
The DUR includes all the information needed to calculate the charges for a particular communication session. For example, in a telephone billing system, the DUR is referred to as the Call Detail Record (CDR). The CDR typically includes the telephone number of the subscriber placing the call, the telephone number called, the time of the call, and the duration of the call. In a pay-per-view TV system, the DUR typically includes the identification number of the subscriber ordering a program and the program identification number for the program ordered. On a regular basis, depending on the size of the DUR Memory and the activity, the DUR is retrieved from the DUR Memory by the billing system. The billing system then applies a billing algorithm against the DUR to calculate the subscriber's charges for usage. Additional charges for equipment rental, flat monthly service charges, taxes, and so on, are calculated by the billing system and added to the usage charges. The total bill is then printed as an invoice

and mailed to the subscriber.

Brief Summary Text (7):
Another common billing method is multi-metering. This method, which is commonly employed in telephone systems, uses multi-metering pulses to calculate charges based on usage. According to this method, pulses representing the cost of usage are generated at regular intervals during a telephone call. The value of each multi-metering pulse is the same, but the timing of the generation of the pulses varies with the cost of the particular call. For example, if the pulses each represent $0.10, and the charge for a local call is $0.10 for three minutes, a pulse is generated every three minutes. If the charge for a domestic long distance call is $1.00 a minute, a pulse representing $0.10 is generated every six seconds. If the charge for an international long distance call is $4.00 a minute, a pulse representing $0.10 is generated every 1.5 seconds. The pulses are detected, counted, and used to calculate use based charges. An example of a multi-metering pulse detector is provided in U.S. Pat. No. 4,868,873 to Kamil.

Brief Summary Text (8):
For business and private phones, multi-metering pulses are typically transmitted to the telephone inaudibly and displayed to the caller on a display unit attached to the telephone. This permits the caller to determine the charge accumulation as the call progresses.

Brief Summary Text (9):
When multi-metering pulses are used in public telephones, a caller typically deposits money in the telephone, and the total value deposited is displayed in a display unit attached to the phone. Alternately, the caller can insert a smart card or a memory card with a prepaid balance into a reader on the telephone or dial a number indicated on the card, and the balance on the card is displayed in the display unit. As the call progresses, the balance displayed is decremented by the charge for each pulse. For example, if a customer deposits $1.00 in a telephone and places a local call which costs $1.00 for every three minutes, and pulses representing $0.10 are generated every three minutes, the balance displayed is decremented by $0.10 every three minutes. In this example, the customer can talk for thirty minutes before the pulses zero the deposit.

Brief Summary Text (10):
Another type of billing method is a prepaid telephone service, an example of which is disclosed in U.S. Pat. No. 4,706,275 to Kamil. According to this method, a subscriber sends a service provider a payment or authorizes that a prepaid amount be charged to his or her credit card. This prepaid amount is credited to the subscriber's account with the service provider. To access the service, the subscriber dials the number of the service provider or a special exchange and keys in an identifying code, such as a Personal Identification Number (PIN). The subscriber's account is checked, and if it is in good standing, the subscriber is provided with a dial tone to place a long distance call as well as the account balance. The billing system decrements the subscriber's balance as the call progresses.

Brief Summary Text (13):
Thus, there is a need for a real time subscriber billing system in which charges for a desired service can be calculated in the standard network routing path of the subscriber.

Brief Summary Text (15):
It is an object of the present invention to provide a real time subscriber billing system that calculates charges for a desired service within the standard network routing path of the subscriber.

Brief Summary Text (16):
It is another object of the present invention to provide a real time subscriber billing system that authorizes service based on a subscriber's usable balance.

Brief Summary Text (21):
According to the present invention, these and other objects are met by a system and method for real time subscriber billing in a standard network routing path. Account

information is stored for at least one subscriber. A determination is made whether the subscriber has a sufficient balance for a desired service based on the stored account information. Service is authorized or denied to the subscriber based on his determination.

Drawing Description Text (3):
FIG. 1a illustrates an exemplary system for real time subscriber billing according to one embodiment of the present invention;

Drawing Description Text (5):
FIG. 1c illustrates in detail an exemplary Network Routing Device for real time subscriber billing according to one embodiment of the present invention;

Drawing Description Text (6):
FIGS. 2a-2d illustrate a central office switch for real time subscriber billing according to a first embodiment of the present invention;

Drawing Description Text (7):
FIGS. 3a-3d illustrate a central office tandem switch for real time subscriber billing according to a second embodiment of the present invention;

Drawing Description Text (8):
FIGS. 4a-4d illustrate a network for real time subscriber billing according to a third embodiment of the present invention;

Drawing Description Text (9):
FIGS. 5a-5d illustrate a central office switch connected to a cellular/wireless system for real time subscriber billing according to a fourth embodiment of the present invention;

Drawing Description Text (10):
FIGS. 6a-6h illustrate a remote calling system for real time subscriber billing according to a fifth embodiment of the present invention;

Drawing Description Text (12):
FIG. 8 illustrates an exemplary real time charge routine according to the present invention;

Detailed Description Text (2):
For ease of discussion, the following embodiments will be described with reference to a telephone network. One skilled in the art will appreciate, however, that the present invention is not limited to a telephone network but is applicable to any type of subscriber system.

Detailed Description Text (3):
FIG. 1a illustrates an exemplary system for real time subscriber billing according to the present invention. In FIG. 1a, there are four subscribers, Sub. 1, Sub. n., Sub. 1R, and Sub. nr, identified with the reference numeral 10. The subscribers 10 can, for example, be standard telephone network subscribers. Subscribers Sub. 1 and Sub. n represent subscribers initiating calls, and subscribers Sub. 1R and Sub. nR represent subscribers receiving calls. Although four subscribers are shown, one skilled in the art will appreciate that the real time billing system according to the present invention can be applicable to any number of subscribers.

Detailed Description Text (7):
The Channel Billing Monitor 20 also includes a relay switch 21 driven by a relay driver 27 as instructed by the Microprocessor 28a. For example, if the subscriber does not have an adequate usable balance, the Microprocessor 28a instructs the relay driver 27 to open the switch 21 to disconnect Sub. n. For certain calls such as emergency calls or calls to the service provider, the Microprocessor 28a can instruct the relay driver 27 to close the switch 21 and connect Sub. n.

Detailed Description Text (11):
Real time billing processing can occur at any of the Channel Billing Monitors 20, the Network Routing Devices 30, or at the subscriber locations. For real time billing

processing occurring in a Channel Billing Monitor 20, the number of cost signals generated or the time elapsed is detected, counted, and compared with stored subscriber account information to determine what service to provide the subscriber. For real time billing processing occurring at a Network Routing Device 30 or at a subscriber location, the number of cost signals generated or the time elapsed is detected by the Channel Billing Monitor at the network Routing Device 30 or at the subscriber location. The number of cost signals or the elapsed time is then counted and compared with stored subscriber account information to determine what service to provide the subscriber.

Detailed Description Text (12):
Real time billing processing at the subscriber location can occur at either the initiating subscriber's end, the receiving subscriber's end, or both. For example, if calls are to be charged to the initiating subscriber, the real time billing processing can occur at the initiating subscriber's end. If the calls are to be charged to the receiving subscriber, e.g., for collect calls, the real time billing processing can occur at the receiving subscriber's end. There can also be instances in which charges for calls can be shared between the initiating subscribers and the receiving subscribers, in which case real time billing processing occurs at each of the subscribers participating in the call.

Detailed Description Text (13):
Real time billing processing can also be performed in a Charge Processor 40. This can be desirable, for example, if real time billing is to be implemented in existing standard network equipment that does not have real time billing capabilities. For real time billing processing occurring in the Charge Processor 40, the number of cost signals generated or the elapsed time is detected by a Channel Billing Monitor 20 and delivered to the Charge Processor 40. The Charge Processor 40 counts the number of cost signals generated or the elapsed time and, based on a comparison of the counted number of cost signals or elapsed time with stored subscriber account information, determines what service to provide. The subscriber account information can be stored in the Charge Processor 40, or at the subscriber location, the Channel Billing Monitor 20, or the Network Routing Device 30. The Charge Processor 40 can be implemented with, for example, a microprocessor.

Detailed Description Text (14):
Stored subscriber account information can be updated periodically or at any time by the Business Management System 50 which manages subscriber payments. Depending on where subscriber account information is stored and where real time billing processing occurs, call charges and subscriber account information can be forwarded from a Channel Billing Monitor 20, a Network Routing Device 30, a subscriber location, or the Charge Processor 40 to the Business Management System 50 on a regular basis or upon completion of each call. The Business Management System 50 reconciles payments made by the subscriber with the call charges and forwards this information to the Channel Billing Monitor 20, the Network Routing Device 30, the subscriber location, or the Charge Processor 40 which updates the subscriber's account, accordingly.

Detailed Description Text (15):
Depending on where the real time billing processing is performed, all the elements shown in FIG. 1a are not necessary. For example, if real time billing processing occurs in the Channel Billing Monitor 20, the Network Routing Device 30, or at a subscriber location, the Charge Processor 40 is not necessary. Also, Channel Billing Monitors 20 are only necessary at those places where cost signals or elapsed time are detected, e.g., at the subscriber location, the Network Routing Devices 30, or at a point in the network routing path in between. There need not be Channel Billing Monitors at all of these locations. FIG. 1a merely shows Channel Billing Monitors at various different locations for ease of illustration.

Detailed Description Text (16):
FIG. 1c illustrates in detail an exemplary network routing device for performing real time subscriber billing according to the present invention. As indicated by the dashed lines in FIG. 1c, the Network Routing Device 30 is connected between subscribers Sub. A and Sub. B, both referenced by reference numeral 10. The Network Routing Device 30 is also connected to the external Billing Management System 50. For ease of illustration, the Network Routing Device 30 shown in FIG. Ic performs all the real

time billing processing, without requiring connection to the Charge Processor 40 shown in FIG. 1a.

Detailed Description Text (17):
Referring to FIG. 1c, the Network Routing Device 30 includes a Processor 60 which performs real time billing calculations. The Processor 60 can be implemented with, for example, a microprocessor.

Detailed Description Text (18):
The Network Routing Device 30 also includes a memory 70 for storing information relating to the subscriber and services. The memory 70 can be subdivided into four submemories: the Communications Control Memory 72, the Billing Data Memory 74, the Tariff Memory 76, and the Detail Use Record Memory 78. The Communications Control Memory 72 stores information regarding the status of the subscribers, including, for example, whether a subscriber is on hook or off hook, as well as the telephone number called and other information. The Billing Data Memory 74 stores information regarding the subscriber's usable balance. The Tariff Memory 76 stores information relating to the charges for various types of services, i.e., the tariff, as wells as taxes and flat rate charges. The Detailed Use Record Memory 78 stores detailed information regarding call charges. Although shown as four submemories for ease of illustration, these submemories can be incorporated into fewer or divided between more memories.

Detailed Description Text (25):
Alternately, the COS can be altered when the difference between the use and the PUL/SUL or PUC/SUC reaches a predetermined amount. The COS can also be linked to special promotions or discounts offered to specific subscribers or classes of subscribers. This can include discounts for volume use or the use of multiple services, etc. For example, when usage reaches a certain level during a given period, discounts can be applied to the subscriber billing rates.

Detailed Description Text (27):
The Processor 60 calculates call charges in real time during a call, applying the duration of the call to the appropriate section of the tariff stored in the Tariff Memory 76. The call charges are then stored as a DUR in the DUR Memory 78. For a telephone call, the call charges are stored as a CDR which includes the called number, the call duration, the call charges, and any such other information as may be desired by the subscriber or the service provider.

Detailed Description Text (29):
The Network Routing Device 30 also includes a System Routing Device 80 for routing calls between subscribers Sub. A and Sub. B, Terminal Alert Generators 82 for generating ring signals to alert a receiving subscriber to go off-hook, and Signal Detector/Decoders 84 for detecting when an initiating subscriber has gone off-hook as well as the number called and providing this information to the Processor 60. For example, when a call to Sub. B is initiated by Sub. A, this is detected by the Signal Detector/Decoder A which also detects the telephone number called. The Signal Detector/Decoder A delivers this information, including the subscriber number, the called number, the billing rate, and the start time of the call to the Processor 60. The Processor 60 determines what service to provide the subscriber and calculates the connect time available to the subscriber based on the value of the subscriber's usable balance stored, for example, in the Billing Data Memory 74.

Detailed Description Text (35):
Alternately or in addition to the warning tones or voice, a button can be provided on the telephone keypad which the subscriber can push to display on an attached display unit the amount of time remaining, the value of the subscriber's balance, or the amount of charges accumulated to date. The attached display unit can be implemented with, for example, an LCD, LED, CRT, Plasma display, or other visual display attached to the telephone.

Detailed Description Text (36):
Another way in which the subscriber can be informed of the charges accumulated to date or the remaining balance is by pressing a predetermined sequence of buttons on the telephone keypad, including identifying information such as a PIN. The subscriber can then connected to a Voice Response System (VRS). In response to digital voice prompts

from the VRS, the subscriber identifies the information desired. The VRS can provide the value of the subscriber's balance or a list of call charges, depending on the subscriber's request.

Detailed Description Text (37):
The subscriber can also be informed of the charges accumulated to date by facsimile on demand. The subscriber dials a predetermined sequence of numbers on the telephone keypad, including identifying information such as a PIN. If dialing from a facsimile machine, the subscriber simply presses start, and the list of chargeable calls since the last billing is retrieved from the DUR memory 78 and forwarded to the subscriber's facsimile machine. If the subscriber has called from a telephone instead of a facsimile machine, he or she is prompted to input the facsimile number which the bill is to be delivered to. The subscriber is provided with a facsimile bill within a time period determined by the Processor 60. For example, if the Processor 60 allows, the facsimile bill can be sent while the subscriber is on the line. If not, the facsimile bill can be sent one hour or twenty four hours later, depending on the capacity of the system. The subscriber can be notified by the VRS of the approximate time that the facsimile bill will be sent.

Detailed Description Text (40):
In FIG. 1c, real time billing processing occurs in a Network Routing Device 30. According to a first embodiment of the present invention, the Network Routing Device can be implemented with a central office switch to which the subscriber is attached. FIG. 2a illustrates a central office (CO) switch 100 in which real time subscriber billing can be performed according to the first embodiment. In FIG. 2a, the CO switch 100 is connected to a subscriber 200 via a subscriber line 210. The CO switch 100 provides the subscriber 200 with telephone service. Although only one subscriber is shown in FIG. 2a, any number of subscribers can be connected to the CO switch 100. In FIG. 2a, real time billing processing can be performed in the central processing unit (CPU) 110 included in the CO switch 100.

Detailed Description Text (41):
FIG. 2b is a flowchart illustrating an exemplary real time billing process performed by the CO switch shown in FIG. 2a. As shown in FIG. 2b, the process begins at step 2000 at which a subscriber with a prepaid deposit or credit limit goes off hook, and the CO switch 100 verifies the subscriber's record which includes the subscriber's telephone number, the COS, the subscriber's usable balance, etc.

Detailed Description Text (42):
Next, at step 2010, the CO switch 100 runs a Communications Warning Message Routine (CWMR), described with reference to FIG. 7, to issue an off hook warning message to the subscriber. At step 2020, the CO switch 100 stores the telephone number dialed by the subscriber in, for example, the Communications Control Memory 72.

Detailed Description Text (43):
At step 2030, the CO switch 100 runs a Real Time Charge Routine (RTCR), described with reference to FIG. 8. At step 2040, a determination is made whether the subscriber has a sufficient usable balance or is approved an overrun based on the RTCR. If not, the process proceeds to step 2050 at which the CO switch 100 denies the telephone call. From step 2050, the process proceeds to step 2060 at which the CO switch 100 performs the Real Time Warning Message Routine (RTWMR), described with reference to FIG. 9, and issues a warning to the subscriber. If the subscriber hangs up, the RTWMR ends. Otherwise, the RTWMR continues until the end of message. The process then ends at step 2140.

Detailed Description Text (45):
If, at step 2080, the CO switch 100 determines that the called number has answered, the CO switch runs the RTCR again immediately at step 2100 so that all charges can be applied in real time. At step 2110, a determination is made whether a call disconnect routine has been invoked because, based on the RTCR, the subscriber does not have a sufficient balance or an approved overrun to go forward with the call. If the call disconnect routine is not invoked, the process proceeds to step 2120.

Detailed Description Text (48):
In FIG. 2a, real time billing processing occurs in the CPU 110 which performs the real

time billing calculations and includes the RTCR and the subscriber account balances. Alternately, real time billing processing can be performed in an Application Central Processor Unit (Apps.CPU) 300 connected to the CO switch 100 via a switch interface 310 as shown in FIG. 2c. In this case, the RTCR and the subscriber account balances are stored in the Apps.CPU 300.

Detailed Description Text (49):
FIG. 2d shows an exemplary real time billing process performed in the CO switch configuration illustrated in FIG. 2c. The flowchart in FIG. 2d is similar to that in FIG. 2b. In FIG. 2d, the process begins at step 2005 at which the subscriber goes off hook, and the CO switch 100 notifies the Apps.CPU 300 of the subscriber ID, i.e., the subscriber's telephone number.

Detailed Description Text (50):
Next, at step 2015, the Apps.CPU 300 directs the CO switch 100 to start the CWMR to issue an off hook warning message. At step 2025, the CO switch 100 stores the telephone number dialed and forwards the number along with the subscriber ID again to the Apps.CPU 300. At step 2035, the Apps.CPU runs the RTCR for the subscriber ID. At step 2040, a determination is made whether the subscriber has a sufficient usable balance or is approved an overrun for the call, based on the RTCR. If not, the process proceeds to step 2055 at which the Apps.CPU 300 instructs the CO switch to deny the call and start the RTWMR. The CO switch 100 denies the call to the subscriber, and the process proceeds to step 2140, where it ends.

Detailed Description Text (53):
If, at step 2080, the CO switch 100 determines that the called number has answered, the process proceeds to step 2105 at which the CO switch informs the Apps.CPU 300 of the call answer, and the Apps.CPU runs the RTCR again immediately so that all charges can be applied in real time. Next, at step 2110, it is determined, based on the RTCR, whether the call disconnect routine has been invoked. If the call disconnect routine has not been invoked, the process proceeds to step 2120 at which the CO switch 100 determines whether the call has ended. If the call has not ended, the process returns to step 2105.

Detailed Description Text (55):
In the embodiment above, real time billing processing occurs in the central office switch or in a processing unit attached to the central office switch that provides telephone service to the subscriber. Real time billing processing can also occur in a switch that is not connected directly to the subscriber line or trunk. This may be desirable, for example, in networks where CO switches are not capable of real time billing processing. In such a case, according to a second embodiment of the present invention, the real time billing processing can be performed in a tandem CO switch which is connected to an end office switch that provides the subscriber with telephone service.

Detailed Description Text (56):
FIG. 3a illustrates a tandem central office switch in which real time billing system processing can be performed according to the second embodiment of the present invention. In FIG. 3a, the tandem CO switch 120 is connected to an end office CO switch 105 which provides a subscriber 200 with telephone service. The real time billing processing can be performed in a CPU 130 included in the tandem CO switch 120. The tandem CO switch 120 is connected to the end office CO switch 105 via standard central office trunks 140. This connection between the tandem CO switch 120 and the end office CO switch 105 can incorporate any method of signaling that provides standard interoffice call handling information such as call setup, call tear down, calling and called number identification, etc. The information transport protocol between CO switches, including end office switches and tandem switches, can be any standard switch protocol, including but not limited to, SS-7, R-2, R-1.5, or R-1.

Detailed Description Text (58):
FIG. 3b is a flowchart illustrating an exemplary real time billing process performed by the tandem central office switch shown in FIG. 3a. Referring to FIG. 3b, the process begins at step 3000 at which the tandem CO switch 120 is notified of an incoming interoffice trunk call from the end office CO switch 105. At step 3010, the tandem CO switch 120 receives the telephone number dialed from the end office CO

switch 105, requests and receives the calling subscriber number, and checks for a Virtual Subscriber Record (VSUB) for the calling subscriber. The VSUB contains information concerning the subscriber 200 such as account balances, credit information, class of service, record of calls, etc. The VSUB can be stored, for example, in the Billing Data Memory 74 in the tandem CO switch 120.

Detailed Description Text (61):
If, at step 3060, the tandem CO switch 120 determines that the called number has answered, the process proceeds to step 3080 at which the RTCR is run again immediately so that all charges can be applied in real time. At step 3090, a determination is made whether the call disconnect routine has been invoked because, based on the RTCR, the VSUB does not have approval to proceed with the call. If the call disconnect routine has not been invoked, the process proceeds to step 3100. At step 3100, the tandem CO switch 120 determines whether the call has ended. If the call has not ended, the process returns to step 3080.

Detailed Description Text (63):
In FIG. 3a, real time billing processing occurs in the CPU 130 which performs the real time billing calculations and includes the RTCR and the subscriber account balances. Alternately, real time billing processing can be performed in the Apps.CPU 300 connected to the tandem CO switch 120 via a switch interface 310 as shown in FIG. 3c. In this case, the RTCR and the subscriber account balances are stored in the Apps.CPU 300.

Detailed Description Text (64):
An exemplary real time billing process performed by the tandem CO switch configuration illustrated in FIG. 3c is shown as a flowchart in FIG. 3d. The flowchart in FIG. 3d is similar to that in FIG. 3b. In FIG. 3d, the process begins at step 3000 at which the tandem CO switch 120 is notified of an incoming interoffice trunk call from the end office CO switch 105.

Detailed Description Text (65):
At step 3015, the tandem CO switch 120 receives the telephone number dialed from the end office CO switch 105, requests and receives the calling subscriber number, and forwards this information to the Apps.CPU 300. The Apps.CPU 300 checks for a VSUB for the calling subscriber, which can be programmed into the Apps.CPU.

Detailed Description Text (69):
If, at step 3060, the tandem CO switch 120 determines that the called number has answered, the process proceeds to step 3085 at which the tandem CO switch informs the Apps.CPU 300 that the called number has answered, and the Apps.CPU 300 runs the RTCR again immediately so that all charges can be applied in real time.

Detailed Description Text (72):
According to this embodiment, a group of trunks, subscriber lines, or services can be identified as a single Billing Group (BG). All the features of the real time subscriber billing system, including prepaid deposits and credit limits, can be applied to the BG as a whole in the same way as previously described for a single subscriber. The trunks, lines, and services associated with the BG can originate in more than one switch.

Detailed Description Text (73):
Service group billing permits subscribers to charge telephone, paging, cellular, and other communication services to a single account. For example, all charges from the BG can be charged to a main billing number. The COS for auxiliary billing numbers can be established by the main billing number.

Detailed Description Text (74):
FIG. 4a illustrates a network tandem CO switch 150 in which real time billing processing can be performed according to the third embodiment of the present invention. In FIG. 4a, the BG is represented by a private/foreign network 400. The private/foreign network 400 comprises one or more switches which are run/administered by an entity other than that running/administering the network tandem CO switch 150. The private/foreign network 400 is connected to the network tandem switch 150 via standard central office trunks 410. The connection between the network tandem CO

switch 150 and the private/foreign network 400 can incorporate any method of signaling that provides standard interoffice call handling information such as call setup, call tear down, calling and called number identification, etc.

Detailed Description Text (75):
In FIG. 4a, the real time billing processing can be performed in a CPU 160 in the network tandem CO switch 150. The CPU 160 is programmed with trunk groups for each different private/foreign network connected. The network tandem CO switch 150 monitors the trunk(s) and runs the RTCR.

Detailed Description Text (76):
FIG. 4b is a flowchart illustrating an exemplary real time subscriber billing process performed in the network tandem CO switch shown in FIG. 4a. Referring to FIG. 4b, the network tandem CO switch 150 is notified of an incoming interoffice trunk call from the private/foreign network 400 at step 4000. At step 4010, the network tandem CO switch 150 receives the telephone number dialed, identifies the trunk ID, and checks for a Trunk Record (TR) for this trunk. The trunk ID uniquely identifies the trunk by a trunk number and contains information on the type of signalling used as well as the COS, the subscriber's usable balance, etc. The TR contains information for the trunk such as account balances, credit information, class of service, record of calls, etc. The TR can, for example, be stored in Billing Data Memory 74 in the network tandem CO switch 150. The network tandem CO switch 150 also performs the RTCR for the TR.

Detailed Description Text (79):
If, at step 4050, it is determined that the called number has answered, the process proceeds to step 4070 at which the network tandem CO switch 150 runs the RTCR again immediately so that all charges can be applied in real time. Next, at step 4080, a determination is made whether the call disconnect routine has been invoked because, based on the RTCR, the TR does not have sufficient approval to proceeds with the call. If the call disconnect routine has not been invoked, the process proceeds to step 4090. At step 4090, the network tandem CO switch 150 determines whether the call has ended. If the call has not ended, the process returns to step 070.

Detailed Description Text (81):
In FIG. 4a, real time billing processing occurs in the CPU 160 which stores the RTCR and the trunk account balances. Alternately, real time billing processing can be performed in an Apps.CPU 300 connected to the network tandem CO switch 150 via a switch interface 310 as shown in FIG. 4c. In this case, the RTCR and the trunk account balances are stored in the Apps.CPU 300.

Detailed Description Text (82):
FIG. 4d is a flowchart illustrating an exemplary real time billing process performed in the network tandem CO switch configuration shown in FIG. 4c. FIG. 4d is similar to FIG. 4b. Referring to FIG. 4d, the process begins at step 4000 at which the network tandem CO switch 150 is notified of an incoming interoffice trunk call from the private/foreign network 400.

Detailed Description Text (83):
At step 4015, the network tandem CO switch 150 receives the telephone number dialed, identifies the trunk ID, and forwards this information to the attached Apps.CPU 300. The Apps.CPU 300 checks for a TR for this trunk. At step 4017, the Apps.CPU 300 performs the RTCR for the TR.

Detailed Description Text (87):
If, at step 4050, it is determined that the called number has answered, the process proceeds to step 4075 at which the network tandem CO switch 150 notifies the Apps.CPU 300 of the call connection. The Apps.CPU 300 runs the RTCR again immediately so that all charges can be applied in real time.

Detailed Description Text (91):
The present invention is not limited to wireline subscribers but may also be applicable to cellular and/or wireless subscribers. Thus, according to a fourth embodiment, the real time billing system can be implemented in a central office switch connected to a cellular/wireless system to which subscribers are attached. FIG. 5a illustrates a telephone company CO tandem switch 170 in which real time subscriber

billing can be performed according to the fourth embodiment. In FIG. 5a, the telephone company tandem CO switch 170 is connected to a cellular/wireless system 500 which provides wireless subscribers 200 with telephone service via, for example, a radio frequency (RF) link 220. In FIG. 5a, real time billing processing can be performed in the CPU 180 in the telephone company tandem CO switch 170. The telephone company tandem CO switch 170 is connected to the cellular/wireless system 500 via intersystem links 195 for voice paths and via a inter-system controller link 190 for inter-system data transfer exchanges.

Detailed Description Text (92):
FIG. 5b is a flowchart illustrating an exemplary real time billing process performed in the telephone company tandem CO switch shown in FIG. 5a. Referring to FIG. 5b, the process begins at step 5000 at which the telephone company tandem CO switch 170 is notified of an incoming call from the attached cellular/wireless system 500 via the inter system controller link 190. The telephone company CO switch 170 is notified of the telephone number dialed and the calling subscriber number and checks for a VSUB for the calling subscriber. The VSUB can, for example, be stored in the Billing Data Memory 74 in the telephone company tandem CO switch 170.

Detailed Description Text (93):
At step 5020, the telephone company tandem CO switch 170 performs the RTCR for the VSUB. A determination is made at step 5030 whether there is a sufficient usable balance or an approved overrun for the VSUB based on the RTCR. If not, the process proceeds to step 5040 at which the telephone company tandem CO switch 170 denies the call and informs the cellular/wireless system 500 of the call disconnect. From there, the process proceeds to step 5120, at which it ends.

Detailed Description Text (94):
If, at step 5030; it is determined that there is a sufficient usable balance or an approved credit, the process proceeds to step 5050 at which the telephone company tandem CO switch 170 processes the call and informs the cellular/wireless system 500 of the call status. Next, at step 5060, the telephone company tandem CO switch 170 determines whether the called number answers. If not, the process proceeds to step 5070 at which a determination is made whether the call attempt has ended. If the call attempt has not ended, the process returns to step 5060.

Detailed Description Text (95):
If, at step 5060, the telephone company tandem CO switch 170 determines that the called number has answered, the process proceeds to step 5080 at which the telephone company tandem CO switch runs the RTCR again immediately so that all charges can be applied in real time. Next, at step 5090, a determination is made whether the call disconnect routine has been invoked. If the call disconnect routine has not been invoked, the process proceeds to step 5100 at which the telephone company tandem CO switch 170 determines whether the call has ended. If the call has not ended, the process returns to step 5080.

Detailed Description Text (96):
If, at step 5090 the call disconnect routine has been invoked, at step 5100 it is determined that the call has ended, or at step 5070 it is determined that the call attempt has ended, the process proceeds to step 5110 at which the telephone company tandem CO switch 170 disconnects the call and updates the VSUB record with the final charge value for this call. The telephone company tandem CO switch 170 creates the final CDR for this call and informs the attached cellular/wireless system 500 of the call disconnect. From step 5110, the process proceeds to step 5120, at which it ends.

Detailed Description Text (97):
In FIG. 5a, real time billing processing occurs in the CPU 180 which stores the RTCR and the subscriber account balance. Alternately, real time billing processing can be performed in an Apps.CPU 300 that is connected to the CPU 180 via a switch interface 310 as shown in FIG. 5c. In this case, the RTCR and the subscriber account balance are stored in the Apps.CPU 300.

Detailed Description Text (98):
FIG. 5d is a flowchart illustrating an exemplary real time billing process performed in the telephone company tandem CO switch configuration shown in FIG. 5c. FIG. 5d is

similar to FIG. 5b. Referring to FIG. 5d, the process begins at step 5000 at which the telephone company tandem CO switch 170 is notified of an incoming call from the attached cellular/wireless system 500. At step 5015, the telephone company tandem CO switch 170 is notified by the cellular/wireless system 500 via the inter system controller link 190 of the subscriber ID, receives the telephone number dialed, and forwards this information to the Apps.CPU 300. The Apps.CPU 300 checks for a VSUB for the calling subscriber, which can, for example, be programmed into the Apps.CPU.

Detailed Description Text (99):
At step 5025, the Apps.CPU 300 performs the RTCR for the VSUB. At step 5030, a determination is made whether there is a sufficient usable balance or an approved overrun for the VSUB based on the RTCR. If not, the process proceeds to step 5040 at which the Apps.CPU 300 informs the telephone company tandem CO switch 170 of the denial and instructs the switch to deny the call. From there, the process proceeds to step 5120, at which it ends.

Detailed Description Text (100):
If, at step 5025, it is determined that there is a sufficient usable balance or an approved overrun for the VSUB, the process proceeds to step 5055 at which the Apps.CPU 300 instructs the telephone company tandem CO switch 170 to process the call. The telephone company tandem CO switch 170 processes the call and informs the Apps.CPU and the cellular/wireless system 500 of the call status.

Detailed Description Text (101):
Next, at step 5060, the telephone company tandem CO switch 170 determines whether the called number answers. If not, the process proceeds to step 5070 at which a determination is made whether the call attempt has ended. If the call attempt has not ended, the process returns to step 5060. If, at step 5060, it is determined that the called number has answered, the process proceeds to step 5085 at which the telephone company tandem CO switch 170 informs the Apps.CPU 300 and the attached cellular/wireless system 500 via the inter-system controller link 195 of the call answer. The Apps.CPU 300 runs the RTCR again immediately so that all charges can be applied in real time.

Detailed Description Text (102):
At step 5090, a determination is made whether the call disconnect routine has been invoked. If not, the process proceeds to step 5100 at which a determination is made whether the call has ended. If the call has not ended, the process returns to step 5085. From a determination at step 5090 that the call disconnect routine has been invoked, a determination at step 5100 that the call has ended, or a determination at step 5070 that the call attempt has ended, the process proceeds to step 5110 at which the telephone company tandem CO switch 170 disconnects the call and informs the Apps.CPU 300 of the disconnect time so that the Apps.CPU can update the VSUB record of the final charge value. The Apps.CPU creates the final CDR for this call. The telephone company tandem CO switch 170 informs the attached cellular/wireless system 500 of the call disconnect. From step 5110, the process proceeds to step 5120, at which it ends.

Detailed Description Text (103):
According to a fifth embodiment of the present invention, the real time billing system can be implemented in a remote calling system which enables a subscriber to charge for calls placed from a telephone other than the subscriber's phone. There are two approaches for billing for remote calling: remote call billing and subscriber line remote call billing.

Detailed Description Text (104):
In remote call billing, when calling from a telephone within a network on a telephone other than the subscriber's phone, the subscriber identifies himself or herself to the network by, for example, keying in a credit identifying code followed by the telephone number to be called. The subscriber is prompted for identifying information such as a PIN and the telephone number to be charged for the call. This information is supplied by the subscriber and transmitted by a home switch or an attached computer in which real time billing processing occurs to a Remote Billing Computer (RBC) in the network. The RBC queries the home switch of the subscriber to determine if the subscriber has a sufficient balance in his or her account to make the call.

Detailed Description Text (107):
Additional information can also be forwarded by the servicing switch to the RBC for transmission to the home switch. This can include the cost of the call, the telephone number dialed, the calling telephone number, date, start time, and ending time of the call, and so on.

Detailed Description Text (108):
In subscriber line remote billing, a subscriber can charge calls inside or outside of a network to his or her account by, for example, dialing a predetermined number and entering his or her own telephone number and PIN. The predetermined number is a number at the home switch of the subscriber. When the subscriber enters the predetermined number and PIN, the switch to which the subscriber is connected provides an outgoing line. The subscriber receives a dial tone and can place a call in a normal manner. The call is charged as described above.

Detailed Description Text (109):
Features that can be provided by the remote calling system according to the fifth embodiment of the present invention include a Personal Phone Number (PPN) and One Number Calling (ONC). The subscriber calls a predetermined phone number and identifies the telephone, pager, voice-mail, e-mail or facsimile machine for calls to be forwarded to. The type of call is detected by, for example, a network switch or a device attached to it for differentiating the type of call. For example, it can differentiate between voice, fax, and computer communications. Any calls to the subscriber's original number are automatically forwarded to the programmed number.

Detailed Description Text (111):
FIG. 6a illustrates a remote calling system in which the real time subscriber billing system can be implemented according to the fifth embodiment of the present invention. In FIG. 6a, a telephone company network includes CO switches 100a and 100b which can perform real time billing processing for calls made from lines other than the subscribers' lines of record. The CO switches 100a and 100b include CPUs 110a and 110b, respectively, in which the real time billing processing occurs. The CO switches 100a and 100b are connected to subscribers 200a and 200b via subscriber lines 210a and 210b, respectively. The CO switches 100a and 100b are connected to a Public Switched Telephone Network (PSTN) 600 via internetwork trunks 610a and 610b and information transport links 620a and 620b, respectively. A subscriber need not be directly connected to a CO switch capable of real time billing to receive calls. For example, as shown in FIG. 6a, a subscriber 200c can be connected directly to the PSTN 600, via a trunk 630. Although only three subscribers are shown in FIG. 6a, one skilled in the art will appreciate that the real time billing system according to the fifth embodiment of the present invention can be applicable to any number of subscribers.

Detailed Description Text (113):
Similar to that of credit card calling, a subscriber in the remote billing system in FIG. 6a can program his or her line with identifying information such as a PIN and then can, by dialing a special code, a home line number, and the PIN, call another line and charge that call to his or her home line account in real time. For example, a subscriber with a home subscriber line 200a can place a call from the subscriber line 200c and charge the call to the subscriber line 200a.

Detailed Description Text (114):
FIGS. 6b-d depict a flowchart illustrating an exemplary real time billing process performed in the remote calling system shown in FIG. 6a. Referring to FIG. 6b, the process begins at step 6000 at which a CO switch 100 is notified that a subscriber line has gone off hook and dialed the special code indicating that a remote call operation is requested. The CO switch is also notified of the target telephone number which the subscriber wishes to call. The CO switch in which the call originates is referred to as the Origin CO switch. The CO switch connected to the subscriber line to which the call is to be charged is referred to as the Home CO switch. The subscriber line to which the call is to be charged is referred to as the home subscriber line, and the subscriber line from which the call request originates is referred to as the requesting subscriber line. For example, referring to FIG. 6a, if a subscriber places a call from a requesting subscriber line 200b, and the subscriber's home subscriber line is 200a, the Origin CO switch corresponds to switch 100b, and the Home CO switch

corresponds to switch 100a.

Detailed Description Text (116):
If the requesting subscriber line does comply with the request, the process proceeds to step 6050 at which the Origin CO switch sends a tone or a voice request to the requesting subscriber line to wait for approval of the subscriber's account. At step 6060, the Origin CO switch determines if the requesting subscriber line and the home subscriber line reside in the same switch, i.e., if the Origin CO switch and the Home CO switch are the same. If the Origin CO switch and the Home CO switch are the same, the process proceeds to step 6070 at which it is determined whether the Home CO switch is capable of real time billing. If the Home CO switch is not capable of real time billing or if it is determined at step 6020 that the requesting subscriber line has not complied with the request of the Origin CO switch, the process proceeds to step 6030 at which the Origin CO sends a denial tone or a voice response to the requesting subscriber line and disconnects the line. The process then proceeds to step 6040 at which it ends.

Detailed Description Text (118):
Next, at step 6090, the NAP 305 checks an internal list of CO switches to determine if the Home CO switch is capable of real time billing. If is not, the process proceeds to step 6100 at which the NAP 305 sends a denial signal to the Origin CO switch. Next, at step 6110, the Origin CO switch sends a denial tone and/or a voice message response to the requesting subscriber line indicating that the call is denied and then disconnects the line. The process then proceeds to step 6120 at which it ends.

Detailed Description Text (119):
If, at step 6090, the Home CO switch is determined to be capable of real time billing, the process proceeds to step 6130:at which the NAP 305 determines the necessary amount required for the initial/secondary period of the call. The initial/secondary periods are time periods which can be established, for example, by the service provider. These periods can be different for different types of calls, e.g., there can be a different time period for a local call versus a long distance toll call.

Detailed Description Text (121):
From step 6140 or a determination at step 6070 that the Home CO switch is capable of real time billing, the process proceeds to step 6150 at which the Home CO switch receives a request and checks for the required amount in the subscriber's account and the validity of the number of the requesting subscriber line. From there the process proceeds to step 6160 in FIG. 5c. At step 6160 it is determined whether the home PIN is valid. If the home PIN is not valid, the process proceeds to step 6170 at which it is determined whether the Origin CO switch is the same as the Home CO switch. If the Origin CO switch is the same as the Home CO switch, the process returns to step 6110. If not, the process proceeds to step 6180 at which the Home CO switch sends to the NAP 305 a signal indicating denial. Then, at step 6190, the NAP 305 sends to the Origin CO switch a signal indicating denial, and the process returns to step 6110.

Detailed Description Text (132):
In FIG. 6a, real time billing processing occurs in the CPUs 110a and 110b in which the RTCRs are stored. Alternately, real time billing processing can be performed in Apps.CPUs 300a and 300b attached to the CO switches 100a and 100b via switch interfaces 310a and 310b, respectively, as shown in FIG. 6e. In this case, the RTCRs are stored in the Apps.CPUs 300a and 300b. The information transport links 620a and 620b are connected to the Apps.CPUs 300a and 300b, respectively.

Detailed Description Text (133):
FIGS. 6f-h depict a flowchart illustrating an exemplary real time billing process performed in the remote calling system shown in FIG. 6e. FIGS. 6f-h are similar to FIGS. 6b-d. Referring to FIG. 6f, the process begins at step 6000 at which an Origin CO switch is notified that a subscriber line has gone off hook and dialed the special code indicating that a remote call operation is requested. The Origin CO switch is also notified of the target telephone number which the subscriber wishes to call.

Detailed Description Text (136):
Then, at step 6055, the Origin CO switch sends to the attached Apps.CPU via the switch interface 310 the number of the home subscriber line, the PIN, the called telephone

number, and number of the requesting subscriber line. Next, at step 6060, the Origin CO Apps.CPU determines if the Origin CO switch and the Home CO switch are the same. If the Origin CO switch and the Home CO switch are the same, the process proceeds to step 6075 at which the Origin CO switch Apps.CPU checks for the validity of the number of the home subscriber line and for the required amount.

Detailed Description Text (139):
Next, at step 6090, the NAP 305 checks an internal list of CO switches to determine if the Home CO switch is capable of real time billing. If is not, the process proceeds to step 6105 at which the NAP 305 sends a signal indicating denial to the Origin CO switch Apps.CPU.

Detailed Description Text (141):
If, at step 6090, the Home CO switch is determined to be capable of real time billing, the process proceeds to step 6130 at which the NAP 305 determines the necessary amount for the initial/secondary period of the call. Next, at step 6140, the NAP 305 sends to the Home CO switch a request for credit for the amount determined in step 6130. The NAP 305 also sends the number of the home subscriber line, the home subscriber PIN, and the number of the requesting subscriber line to the Home CO switch.

Detailed Description Text (157):
FIG. 7 illustrates an exemplary routine for initiating a communications warning message according to the present invention. Referring to FIG. 7, the Communications Warning Message Routine (CWMR) for initiating a warning message begins at step 7000, with the subscriber initiating a new communication by, for example, lifting the telephone handset to place a call. Next, at step 7010, the subscriber's balance, including for example the PUL/SUL and/or PUC/SUC, is looked up. At step 7020, the subscriber balance is compared with a predetermined first limit to determine if the balance exceeds the first limit. If not, the routine proceeds to step 7030, at which the subscriber's balance is compared with a predetermined second limit to determine if it exceeds the second limit. If not, the routine proceeds to step 7040, at which the subscriber's balance is compared with a predetermined third limit to determine if the balance exceeds the third limit. If not, the routine continues comparing the subscriber's balance with a series of predetermined limits up to step 7050 at which the subscriber's balance is compared with a predetermined nth limit, the last of a series of predetermined limits, to determine if the balance is within the nth limit. If the balance is not within the nth limit, the routine proceeds to step 7060 at which a disconnect warning is issued to the subscriber, indicating that the subscriber does not have a sufficient balance to establish a new communication. The routine then ends at step 7130.

Detailed Description Text (160):
FIG. 8 illustrates an exemplary real time charge routine according to the present invention. Referring to FIG. 8, the Real Time Charge Routine (RTCR) starts at step 8000, at which it is determined if it is an appropriate time for a charge to be accumulated against a subscriber's balance. The appropriate time for the charge to be accumulated can be prior to, during, or after a communication is completed, depending, for example, on a prearranged agreement between the service provider and the subscriber. If at step 8000 it is determined that it is an appropriate time to accumulate a charge, a determination is made at step 8010 whether the communication is a flat rate communication, that is a communication with a single rate. An example of a flat rate communication is a local telephone call that is charged a flat rate of $0.50. If the communication is a flat rate communication, the flat rate charge is calculated at step 8020.

Detailed Description Text (161):
If the communication is determined at step 8010 not to be a flat rate communication, a determination is made at step 8030 whether a complex charge is to be calculated for the communication. For example, a call may be charged $1.00 for the first three minutes and then $0.50 cents for every minute thereafter in the case of a voice channel. For a data connection, there may be a $2.00 charge plus a $0.10 charge for every megabyte transferred. There may also be different charges for upstream and downstream data transmissions. If a complex charge is to be calculated, this calculation is performed at step 8040.

Detailed Description Text (167):
FIG. 9 illustrates an exemplary real time warning message routine according to the present invention. Referring to FIG. 9, the Real Time Warning Message Routine (RTWMR) is invoked at step 8110 or step 8120 shown in FIG. 8. The RTWMR begins at step 9000 at which the subscriber starts a new communication by, for example, lifting the telephone handset to place a call. Next, at step 9010, the subscriber's balance is looked up. At step 9020, the subscriber's balance is compared with a predetermined first limit to determine if the balance exceeds the first limit. If not, the routine proceeds to step 9030 at which the subscriber's balance is compared with a predetermined second limit to determine if it exceeds the second limit. If not, the routine proceeds to step 9040 at which the subscriber's balance is compared with a predetermined third limit to determined if the balance exceeds the third limit. If not, the routine continues comparing the subscriber's balance with predetermined limits up until step 9050 at which the subscriber's balance is compared with a predetermined nth limit, the last of a series of predetermined limits, to determine if the balance is within that limit. If the subscriber's balance is not within the nth limit, the routine proceeds to step 9060 at which a disconnect warning is issued.

Detailed Description Text (173):
In addition to the various features of the real time billing system described above, there are additional features which can be provided by the real time subscriber billing system. For example, there can also be a phone lock feature, in which the subscriber can alter the COS from a telephone by, for example, pressing a predetermined sequence of keys on the telephone pad including identifying information such as a PIN. This phone lock feature establishes a COS selected by the subscriber until a new COS is selected by the subscriber using the same method. For example, the subscriber can select a COS in which a telephone is limited to dialing local calls unless a PIN is keyed in before or after the dialed number.

Detailed Description Text (174):
Another feature provided by the real time subscriber billing system according to the present invention is electronic funds transfer. Using this feature, the subscriber can authorize the telephone company to electronically transfer funds from a bank account or a credit card account to replenish the subscriber's balance on a regular basis.

Detailed Description Text (175):
Another feature provided by the real time subscriber billing system according to the present invention is the payment for purchases which are ordered by phone. The subscriber's credit card numbers, names, addresses, and other pertinent credit information can be stored in the real time billing system to simplify use of the phone as an order entry device. To use this feature, the subscriber places a call to purchase a product or a service. After identifying the product or service, the subscriber releases the appropriate credit card number and other pertinent information by pressing a predetermined sequence of keys on the telephone pad, including the PIN. The subscriber can pay at his or her convenience and need not make any payment as long as the subscriber's balance is positive. The subscriber can be notified monthly or at other regular intervals as to how much must be paid to reestablish the original subscriber's balance. The subscriber can increase his or her balance at any time.

Detailed Description Text (176):
The real time subscriber billing system can also be the basis of a credit/debit card charging system. That is, a subscriber can charge products or services, such as power, gas, water, etc., to his or her prepaid deposit or credit limit. For regular charges such as utility services, the billing can be automatically charged to the subscriber's account and paid to the utility company by the telephone company. For other purchases, each transaction can be approved by the subscriber and can be computed only if the subscriber's balance is not exceeded.

Detailed Description Text (177):
The procedures for charging the subscriber's account can be similar to those described above for calling from a remote telephone. In addition, the subscriber can arrange for the increase of deposits or the payment of the account by any third party.

Detailed Description Text (178):
According to another aspect of the present invention, a Lineless Telephone Number

(LTN) is provided. A subscriber who places a deposit or is granted a credit limit can be assigned a telephone number without requiring the subscriber to have a physical telephone line. The number can be answered by a prerecorded voice. A subscriber can retrieve messages on his or her LTN and can leave messages for all callers or for specific callers. This service can be particularly useful for subscribers that cannot afford a private phone or pager. Subscribers can also use the LTNs to place calls. When calls are placed from the home switch or from a remote telephone, billing can be processed and managed as previously described for regular subscribers placing such calls.

Detailed Description Text (179):
The embodiments above have been described with reference to a telephone network. However, it should be understood that the invention is also applicable to other types of subscriber systems, such as the Internet, cable television networks, and utilities such as gas and water.

Other Reference Publication (1):
Cotton et al., "Real-time billing systems", Cellular Business, vol. 12, No. 2, pp. 168, Feb. 1995.*

CLAIMS:

1. A system for real time subscriber billing in a standard network routing path, comprising:

means for storing account information for at least one subscriber, the account information including information regarding the subscriber's usable balance, wherein the usable balance is at least in part established by a system operator based on a credit limit established and verified by the system operator for the subscriber;

means for determining, based on said account information, whether the subscriber has a sufficient balance for a desired service; and

means for authorizing or denying service to the subscriber based on the determination, wherein at least one of the means for storing, the means for determining, and the means for authorizing or denying service is located outside a subscriber location, within the standard network routing path, in a central office switch.

14. The system of claim 10, wherein the communication session is a telephone call, an Internet session, or a pay-per-view television program.

18. A method for real time subscriber billing in a standard network routing path, the method comprising the steps of:

storing account information for at least one subscriber, the account information including information regarding the subscriber's usable balance, wherein the usable balance is at least in part established by a system operator based on a credit limit established and verified by the system operator for the subscriber;

determining, based on said account information, whether the subscriber has a sufficient balance for a desired service; and

authorizing or denying service to the subscriber based on the determination, wherein at least one of the steps of storing, determining, and authorizing or denying service is performed outside a subscriber location, within the standard network routing path, in a central office switch.

31. The method of claim 27, wherein the communication session is a telephone call, an Internet session, or a pay-per-view television program.

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DOCUMENT-IDENTIFIER: US 6058170 A
TITLE: Telephone billing with summary information

Abstract Text (1):
A method and system for automatically generating telephone bills that include customer defined or requested summary information. Customer specific data including pricing data and summary parameters are stored. A plurality of records, each record describing a telephone call, are generated. The record is received at a billing analysis system, which determines a priced call value for each call using the record and the customer specific data and determines summary information for the customer using the record, the priced call values and the summary parameters. A telephone bill for the customer is generated based on the summary information for the customer. The bill may be generated periodically, on a predetermined schedule, or upon demand of the customer. Online access to summary information is also provided.

Application Filing Date (1):
19970310

Brief Summary Text (2):
The present invention relates to the processing of telephone calls, and in particular, to the billing of the costs of such calls.

Brief Summary Text (4):
Telephone bill summary information is useful for a variety of purposes. For example, bill summary information may be used to automatically debit accounts for payment, to distribute charges to those who incurred them, and for cost tracking and reduction. Conventional telephone bills provide standard summary information, such as the total charges due. The customer who receives the bill has no control over the summary information presented on the bill and cannot define or request custom summary information to appear on the bill. Recipients of such bills must themselves generate the summary information they need. It would be useful if bills including the desired customer defined or requested summary information were automatically generated by the telephone billing process.

Brief Summary Text (5):
Conventional telephone bills are generated periodically, but a need for the information on the bills may arise before the end of a period. For example, telephone bills are often generated monthly, but it may be desired to debit accounts more frequently. Likewise, in order to track or reduce costs, billing information, and in particular, billing summary information, may be need more frequently than bills are generated, or even on demand. It would be useful if telephone billing summary information were available in real-time.

Brief Summary Text (7):
The present invention is a method and system for automatically generating telephone bills that include customer defined or requested summary information.

Brief Summary Text (8):
In order to bill for telephone service according to the present invention, customer specific data including pricing data and summary parameters are stored. A plurality of records, each record describing a telephone call, are generated. The record is received at a billing analysis system, which determines a priced call value for each call using the record and the customer specific data and determines summary

information for the customer using the record, the priced call values and the summary parameters. A telephone bill for the customer is generated based on the summary information for the customer. The bill may be generated periodically, on a predetermined schedule, or upon demand of the customer. Online access to summary information is also provided.

Drawing Description Text (3):
FIG. 1a is a block diagram of one embodiment a telephone call billing system, in which the present invention may be implemented.

Drawing Description Text (4):
FIG. 1b is a block diagram of the telephone call billing system of FIG. 1a, showing a customer profile including summary parameters according to the present invention.

Drawing Description Text (6):
FIG. 3 is a block diagram of another embodiment a telephone call billing system, in which the present invention may be implemented.

Drawing Description Text (7):
FIG. 4 is a block diagram of another embodiment a telephone call billing system, in which the present invention may be implemented.

Detailed Description Text (2):
Referring to FIG. 1a, there is shown a block diagram of a telephone system in accordance with one embodiment of the present invention. There is shown a calling telephone 102, a called telephone 104, a telephone network switch 106 and a Call Detail Database (CDD) 108. An Automatic Message Accounting (AMA) record, represented by a block 110, is also shown. As indicated by the figure, a billable call may be initiated at telephone 102 and routed through switch 106, e.g., an AT&T 4ESS.RTM. switch, to telephone 104. The switch generates AMA record 110, which includes the information necessary to rate the call. The AMA record is passed to CDD 108. It should be noted here that there are an abundance of protocols and transmission media that may be used for passing the data from the switch to the CDD. For example, suitable protocols include the well known File Transfer Protocol (FTP) and Transmission Control Protocol/Internet Protocol; and suitable transmission media include twisted shielded pair wires, fiber optic lines, coaxial cable, and wireless links. Moreover, these protocols and media are suitable for use in all data transfers and queries hereinafter described.

Detailed Description Text (4):
The billing analysis system performs its functions the instant the switch passes the AMA record to the CDD (i.e. it performs call pricing in real-time). In order to achieve real-time processing of AMA records the invention must overcome two primary obstacles. First, the customer specific data is fragmented across multiple business units, with no cohesive notion of an integrated customer profile. This situation is depicted in FIG. 1a, which shows several customer profile databases 114, 116 and 118. As shown in the figure, the invention overcomes this obstacle through the use of an integrated customer profile database located within the billing analysis system. Software tools update the integrated customer profile database in response to updates of the individual customer profiles 114, 116 and 118 so that the integrated database always contains current information on all customers.

Detailed Description Text (5):
The volume of customer and telephone call data makes it difficult to store, rate, and query call data in real-time. To surmount this obstacle the invention accumulates summary information as each individual call (AMA) record is received and rated in real-time. It is generally desirable for a telephone network to maintain a customer's current bill. Thus, one type of accumulated summary information may be current bills for each network customer. Nevertheless, it may be useful to accumulate other types of summary information for particular customers. The nature of the accumulated summary information for a particular customer depends upon the services subscribed to by that customer.

Detailed Description Text (8):
The processing involved in summary billing is shown in FIG. 1b, which, as an example,

shows the present invention implemented in the telephone billing system of FIG. 1a. The present invention may be similarly implemented in the telephone billing systems shown in FIGS. 3 and 4.

Detailed Description Text (9):
A customer places calls from calling stations 152. Each call is routed through a network switch 156, which generates a corresponding AMA record 160. The AMA record includes an indication of the customer that placed the call. Typically the Automatic Number Identification (ANI) is used for this purpose. In an ANI system, the number of the telephone station from which a call is initiated is determined and used to identify the party who initiated the call. Each AMA record is passed to CDD 158, making the record available for call pricing. Each AMA record is passed from CDD 158 to billing analysis system 162, which applies the customer specific billing parameters contained in the attached customer profile database, such as database 164. The billing analysis system 162 then generates updates to summary information stored in the summary database (SD) 163 based on the customer profile 166 stored in customer profile database 164. The updates to the summary information are generated in real-time as calls are placed and AMA records generated. Updated summary information is available for access immediately after a summary information update is entered into SD 163. Thus, updated summary information may be accessed whenever desired. For example, a bill may be generated in real-time upon demand of a customer. Summary information stored in SD 163 may also be made available to customers without generating a bill. Snapshot summaries, of the current status of the customer's account, may be generated. In addition, online access to summary information may be provided, such as by online terminal 170.

Detailed Description Text (10):
Customer profile 166 includes summary parameters 167 that define the summary information that is to be generated and updated for the customer. Customers may subscribe to billing services which provide semi-custom summary information or fully custom summary information may be provided. The summary parameters may be defined directly by the customer, or the summary parameters may be defined based on summary information requested by the customer. Customer profile 166 also includes pricing data 168 that is used to price each telephone call. For example, summary parameters 167 may specify that summary information be compiled based on the number of call minutes since the last bill, the total cost of calls made on a particular day, or on each day, during the billing period, the total cost of calls made to each of a given set of numbers, area codes, cities, states, countries, etc. Likewise, summary information may be compiled based on the time or cost of calls in one or more discount plans, the savings provided by a discount plan, or based on the type of calls made, such as collect calls, etc.

Detailed Description Text (13):
Upon receiving an AMA record, such as 160a from CDD 158, the first step billing analysis system 162 takes is to rate the call (step 202). It must then match the rated call to the customer (step 204) so that customer specific parameters can be applied to the call. Several well known techniques can be used to match the rated call to the customer. One such technique uses Automatic Number Identification (ANI). In an ANI system, the number of the telephone station from which a call is initiated is determined and used to identify the party who initiated the call. Accordingly, in the FIG. 1b embodiment, the number of a telephone, such as 152a may be determined and passed to the billing analysis system along with the AMA record. The billing analysis system may then cross-reference the number to the customer profile containing the customer specific data to be used for the current call. For example, AMA record 160 is cross-referenced to customer profile 166, which also relates to that customer. Customer profile 166 contains customer specific pricing data 168 that is used to price the call, as well as summary parameters that define the summary information that is to be generated. Once the appropriate profile, or profiles, if there are multiple customer profile database, have been determined, the billing analysis system applies the pricing data contained in the profiles to the rated call to produce a priced call value (step 206). The billing analysis system then generates summary information updates defined by the summary parameters based on the priced call value (step 208). The priced call value (processed AMA record) is stored in the CDD and the summary information update for the customer is stored in the SD (step 212). As described in relation to FIG. 1a, an alternative scheme is to store both the priced call value and

current bill--collectively termed "the priced call data"--in the SD; in which case, step 212 would involve storing the priced call value and the current bill in the SD. Finally, a bill is generated based on the summary information stored in the SD (step 214).

Detailed Description Text (15):
Referring now to FIG. 3, there is shown an alternative embodiment of a telephone system in accordance with the present invention. The customer profiles are not shown, but are similar to those shown in FIG. 1b. As shown in the figure, a call may be initiated at a first telephone 302 and directed to a second telephone 304. The call is routed by a network switch 306, which generates an AMA record 310 for the call. The AMA record is passed to a billing analysis system 312 which applies customer specific pricing data to the AMA record to produce a processed AMA record. The AMA record and processed AMA record are then passed to a CDD 308 for storage.

Detailed Description Text (18):
FIG. 4 shows another embodiment of a telephone system in accordance with the present invention. The customer profiles are not shown, but are similar to those shown in FIG. 1b. In the FIG. 4 embodiment, as in the previous embodiments, a call initiated at a first telephone 402 may be directed to a second telephone 404 through a network switch 406, which generates an AMA record 410. However, in the FIG. 4 embodiment the AMA record is passed to a Rating Complex (RC) 412. The RC is a unit which performs the functions of the CDD and billing analysis system, and may therefore be characterized as a combined CDD and billing analysis system. As shown in the figure, the RC may include a SD 413 for storing the summary information separately from the AMA records and processed AMA records. As in the prior described embodiments, alternative schemes may be employed for the storage of the AMA records, processed AMA records, and summary information.

Detailed Description Text (19):
It should be noted that although all three embodiments discussed above depict a call as being initiated from a first telephone and directed to a second telephone, it is possible that calls may be initiated by, and directed to, many different types of communication devices. For example, a call may be initiated by a fax machine and directed to a personal computer. Moreover, a call may be initiated by a single communication device and directed to multiple communication devices. For example, a call may be initiated by a fax machine and directed to multiple independent personal computers. For purposes of this description, each instance of a single initiating call being directed to a different terminating device will be considered an independent call.

CLAIMS:

1. A method of billing for telephone service comprising the steps of:

receiving summary parameters defined by a customer, the summary parameters defining summary information that is to be generated;

storing customer specific data including pricing data and summary parameters for the customer;

generating a plurality of records, each record describing a telephone call;

in response to receiving each record at a billing analysis system performing the step of:

determining a priced call value for each call using the records and the customer specific data; and

generating summary information that is specified by the summary parameters using the records and the priced call values.

2. The method of claim 1, further comprising the step of:

generating a telephone bill for the customer based on the summary information for the

customer.

3. The method of claim 2, wherein the telephone bill is generated periodically.

4. The method of claim 2, wherein the telephone bill is generated based on a predetermined schedule.

5. The method of claim 2, wherein the telephone bill is generated when at least a portion of the summary information reaches a predetermined threshold.

6. The method of claim 2, wherein the telephone bill is generated in real-time upon demand of the customer.

10. A system for billing for telephone service comprising:

a database storing customer specific data including pricing data and summary parameters for a customer the summary parameters defined by the customer and defining summary information that is to be generated;

a network switch generating a plurality of records, each record describing a telephone call; and

a billing analysis system receiving the records, and in response to receiving each record, accessing the database to obtain the customer specific data, determining a priced call value for each call using the record and the pricing data, and generating summary information that is specified by the summary parameters using the records and the priced call values.

11. The system of claim 10, further comprising:

a bill generation device generating a telephone bill for the customer based on the summary information for the customer.

12. The system of claim 11, wherein the telephone bill is generated periodically.

13. The system of claim 11, wherein the telephone bill is generated based on a predetermined schedule.

14. The system of claim 11, wherein the telephone bill is generated when at least a portion of the summary information reaches a predetermined threshold.

15. The system of claim 11, wherein the telephone bill is generated in real-time upon demand of the customer.

19. A system for billing for telephone service comprising:

means for receiving summary parameters defined by a customer, the summary parameters defining summary information that is to be generated;

means for storing customer specific data including pricing data and summary parameters for the customer;

means for generating a plurality of records, each record describing a telephone call;

means for receiving the records;

means, responsive to receipt of each record, for determining a priced call value for each call using the records and the customer specific data and

generating summary information that is specified by the summary parameters using the records and the priced call values.

20. The system of claim 19, further comprising:

means for generating a telephone bill for the customer based on the summary

information for the customer.

21. The system of claim 20, wherein the telephone bill is generated periodically.

22. The system of claim 20, wherein the telephone bill is generated based on a predetermined schedule.

23. The system of claim 20, wherein the telephone bill is generated when at least a portion of the summary information reaches a predetermined threshold.

24. The system of claim 20, wherein the telephone bill is generated in real-time upon demand of the customer.

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L9: Entry 7 of 103 File: USPT Aug 13, 2002

DOCUMENT-IDENTIFIER: US 6434537 B1
TITLE: Cellular telephone billing management system

Abstract Text (1):
The present invention is directed to a telephone billing management method for cellular telephones. The objective is to provide the user of a cellular telephone a cost accounting and management tool. The amounts of various classes of service used in the current billing period are downloaded and displayed at the user phone terminal, for instance on the wireless handset. Specifically, cumulative billing information for the present billing period is downloaded and displayed at the user's location during the call set up-period signalling period. The charge rate for the current call can also be downloaded. Once the call is stabilized, the duration (air time) and cost of the present call can be calculated and displayed in real time. Thus, for management purposes, the user has access to the provider's information on all charges up to the present call and the duration and cost of the present call can be calculated and displayed in real-time without further burden on the provider.

Application Filing Date (1):
19940801

Brief Summary Text (3):
The present invention is directed to a telephone billing management method for cellular telephones. Specifically, during the call set up signalling period, cumulative billing information for the present billing period is downloaded and displayed at the user's location and duration and cost of the present call is calculated and displayed.

Brief Summary Text (5):
U.S. Pat. No. 3,769,463 issued Oct. 30, 1973 to Graham et al teaches an electronic long distance telephone call computer and recorder for computing elapsed time and charges for a particular call as well as means for calculating a cumulative total of charges. General operation of the Graham apparatus requires first ascertaining from a chart the regular and overtime charges for the call to be made and programming that information into the apparatus. No such set-up on the part of the user is necessary with the present invention.

Brief Summary Text (6):
U.S. Pat No. 4,091,238 issued May 23, 1978 to Samuels et al. teaches an apparatus which calculates and displays the accrued cost of a telephone call capable of taking into account local and long distance call rates, message unit areas, etc.

Brief Summary Text (7):
U.S. Pat. No. 5,109,401 teaches a radio telecommunication device for use in an automobile radio communication apparatus (mobile cellular phone) capable of informing a user when a call charge for one call exceeds a preset call charge and which is also capable of stopping speech communication when such preset call charge has been exceeded and which is also capable of informing a user when an accumulated call charge for a plurality of calls exceeds a cumulative preset call charge.

Brief Summary Text (8):
U.S. Pat. No. 5,134,651 issued Jul. 28, 1992 to Ortiz et al teaches a pay telephone arrangement for a mobile phone wherein charges for a particular call are displayed to an owner and a user so that the call can be paid for immediately by the customer.

Brief Summary Text (9):
None of the prior art cited downloads the provider's cumulative billing information for the current billing period during the call set up signalling period before the present call is stabilized as does the present invention. The present invention method provides more foresight and manageability to the subscriber than prior art methods.

Brief Summary Text (11):
The present invention is directed to a telephone billing management system method for cellular telephones. The objective is to provide the user of a cellular telephone a cost accounting and management tool. The amounts of various classes of service used in the current billing period are downloaded and displayed at the user phone terminal, for instance on the wireless handset. Specifically, cumulative billing information for the present billing period is downloaded and displayed at the user's location during the call set up-period signalling period. The charge rate for the current call can also be downloaded. Once the call is stabilized, the duration (air time) and cost of the present call can be calculated and displayed in real time. Thus, for management purposes, the user has access to the provider's information on all charges up to the present call and the duration and cost of the present call can be calculated and displayed in real-time without further burden on the provider.

Drawing Description Text (2):
FIG. 1 is a flow diagram of a two-way call signalling set-up period and the downloading of billing information;

Drawing Description Text (3):
FIG. 2 is a block diagram of an exemplary cellular telephone; and

Detailed Description Text (2):
Subscribers to cellular telephone services typically do not know how much of each grade of service they have used during a billing period until they get their monthly statements. If they had knowledge of this information as they went along, they could reduce their charges. For example a cellular operator may charge a premium rate per minute of air time in prime time and a much reduced rate per minute of air time in off peak hours. Subscribers may be obliged to agree to be billed for a minimum of, for instance, three hours of air time per month. At the end of the month, if the minimum time is not used, the portion may be billed at the higher rate. It is thus to the advantage of users to be able to tell how much time they have used and be able to use enough low rate air time to finish their minimum number of billable hours before the end of their billing cycle to avoid being billed at the higher rate. Other types of billing obligations and arrangements with different providers also exist. Regardless of the type of arrangement, access to the provider's cumulative billing information for a current billing period when placing an upcoming call would translate into a valuable management tool for the user. The present invention billing management method makes such information available to subscribers and includes the advantage of also displaying billing information for the current call with no added burden to the provider. Cellular telephone systems incorporating this feature may have a significant advantage in the market place at very little added manufacturing cost.

Detailed Description Text (3):
The cellular telephone systems according to the present invention include known real-time call processing node computers and a plurality of cellular telephones having display units. For example, the cellular telephone system's real-time call processing computer may be a 3B15 Call Processing Node (CPN) computer manufactured by AT&T. The CPN computer includes an MC68030 microprocessor or equivalent processing circuitry, memory and known cellular communication circuitry having an IS54B standard interface to transmit billing information along with the audio information. The CPN computer includes stored programs for monitoring and storing billing information including current and cumulative billing for each cellular phone or account. The stored programs further include control software for transmitting selective portions of the current and cumulative billing information to respective telephones. Preferably, the billing information is transmitted or downloaded to a respective cellular telephone during a signalling set-up period initiated by a user when beginning a current call.

Detailed Description Text (4):

The billing information is based upon various factors including, for example, the subscribers directory number, the time stamp when a cell begins and which cells are utilized during the call, the called telephone number, the elapsed air time used, and the PSTN facilities-used. Other factors which may affect the billing information includes call waiting and call conferencing features utilized.

Detailed Description Text (5):
FIG. 1 illustrates an exemplary flow diagram of the downloading of billing information during a signalling set-up period. To initiate a call from a cellular telephone, the user dials the desired telephone number and broadcasts the dialed number, typically by pressing a send key (step 10). The cell cite closest to the telephone receives the dialed number and associated identification information and relays the information to the CPN (steps 12 and 14). The CPN processes the information, including verifying the subscriber (step 14). Upon satisfactory completion of the subscriber information processing, the CPN sends information to the telephone, including information to tune the audio circuitry to a voice channel and the current and cumulative billing information (step 16). The billing information received by the telephone is stored in internal memory to permit the telephone to display the information and to calculate, update and maintain the cost of the current call. The current call cost can then be displayed on the display in the telephone handset.

Detailed Description Text (6):
Referring to FIG. 2, an exemplary block diagram of a cellular telephone contemplated for the billing management system of the present invention is shown. Preferably, the telephone utilizes a time division multiple access (TDMA) transmission scheme with a IS54B standard interface, which will be described in more detail below. In this embodiment, the cellular telephone 20 includes microprocessor 22, memory 24 and handset 26. Memory 24 may include RAM, PROM and EEPROM memory for storing system and application programs as well as information, such as billing, scratch pad, key stroke and active channel information. The system and/or application programs include software for recording, processing and displaying the billing information downloaded from the CPN computer.

Detailed Description Text (8):
The transceiver 38 is also coupled to IS54B interface 40 which extracts the billing information from the signal received by the transceiver, in response to instructions from microprocessor 22. Microprocessor 22 stores the billing information in memory 24. An example of a suitable cellular telephone is the model 3610 manufactured by AT&T adapted to incorporate a TDMA transmission scheme and the IS54B standard interface. Another example of a suitable cellular telephone is the Micro Digital.TM. Personal XL manufactured by Motorola.

Detailed Description Text (9):
As noted above, during the two way call set up signalling period, information regarding cumulative air time and billing for the particular caller are downloaded from the provider's billing computer and visually displayed at the user's location, for instance on the display located on the user's handset. Other types of displays are also possible. The two way call set-up signalling period is known in the art and refers to the period of time in which messages travel back and forth between the user phone and the provider until the actual call is stable.

Detailed Description Text (10):
In the present invention, the provider's base station CPN computer is preprogrammed to download billing information in the two way call set-up massaging so that during call set-up, the present billing information for each class of service for the present billing period is downloaded into the user phone terminal along with all necessary information (charges per minute, etc.) of the present call so that the user phone terminal maintains a running total of the time and dollar amount for the class of service currently being used.

Detailed Description Text (11):
Once the call is stabilized and in progress, air time and billing in real time are displayed to the user at the user's location and may optionally be added to the previous cumulative data for an updated cumulative total display. Such information could include, for example, the amount of each priority of service (prime time,

evening and weekend, etc.) used so far in the current billing period. The priority of service of the current call would also be downloaded (or figured out from a local clock) and the amount of time used in that class of service could be incremented and displayed throughout the current call. Thus, for management purposes, the user would have the provider's information on all charges up to the present call and the duration and cost of the present call could be calculated in real-time without further burden on the provider. Other possible features include displaying whether or not a user is ahead or behind schedule in using certain minimum billing amounts for the billing period. For example, in off hours, a user might be 70% through the billing period and have used only 35% of the minimum allotment.

Detailed Description Text (12):
Referring now to FIG. 3 there is shown a flow diagram for a telephone billing management system method for a cellular telephone system having at least one provider with a CPN computer or equivalent real-time communication processor, and a plurality of user phone terminals with display units. As described above, the user phone terminal is a state of the art cellular telephone equipped with known microprocessor and support circuitry, audio processing circuitry as well as an IS54B standard interface. As noted above, these components are capable of being programmed to carry out the method of the present invention. In FIG. 3, steps 50 and 52 are shown which involve preparing the system for using the method of the present invention, and steps 54 through 60 show an embodiment involving the billing display steps of the present invention.

Detailed Description Text (13):
Thus, in step 50 the provider's CPN computer is preprogrammed to download cumulative current billing period information and transmit, via cellular radio telecommunication channels, billing information to at least one user phone terminal during the two-way call signalling set-up period. In addition to cumulative current billing information the computer could be preprogrammed to download all necessary charge rate information (e.g., charge rate per minute) of the present call to allow the user phone terminal to maintain a running total of the air time charges for the class of service being used during the current call. In step 52 the user phone terminal is preprogrammed to receive, process and display downloaded current billing period information transmitted from the CPN computer. It should be noted that the visual display unit could also be located on the cradle housing of the cellular phone or elsewhere in the vicinity of the user.

Detailed Description Text (14):
In addition to receiving, processing and displaying cumulative current billing period information, the user phone terminal could also be preprogrammed to keep a running total of the air time and charges for the class of service being used during the current call and to display this to the user. Having preprogrammed the provider's billing computer and a user phone terminal to perform these functions, the system may now be used to implement the billing display and calculations.

Detailed Description Text (15):
Referring again to FIG. 3, in step 54, after initiation of a signalling set-up period, the cumulative current billing period information is downloaded from the provider's CPN computer to the user phone terminal, via cellular radio telecommunications channels. In step 56 the downloaded information is visually displayed to the user. Such visual displays are known in the art and are currently used for imparting to the user various types of information, for example, identifying the phone number of a calling party. The display unit could be a light emitting diode (L.E.D.) display unit or other digital display unit. In step 58 the user phone terminal keeps a running total of the air time and charge for the class of service being used during the current call and displays this to the user. In step 60 the call is ended, thus ending the running calculation for current call charges as well as the visual display. The call may be ended, for example, by the user replacing the phone in its cradle, pressing an appropriate button on the handset or cradle or any other means known in the art.

Other Reference Publication (1):
"Creditfone Brings Benefits of Cellular Telephones to Travelling Public", News Release Jul. 2, 1986, p. 11 Dialog File 16 Acc #01491755.*

Other Reference Publication (6):
"Portable Cellular Telephone 3610", AT&T Brochure, 1993.

CLAIMS:

1. A telephone billing management method for a cellular telephone system having at least one provider with a real-time node computer and a plurality of user phone terminals with display units, said method comprising the steps of: preprogramming the provider's real-time node computer to download cumulative current billing period information and transmit via cellular radio telecommunication channels said information to at least one of the user phone terminals during a two-way call signalling set-up period initiated by a user when beginning a current call; and downloading and transmitting from the provider's real-time node computer said cumulative current billing period information to the user phone terminal during said two-way call set-up period via the cellular radio telecommunications channels, the user phone terminal being capable of displaying said current billing period information on the display unit.

2. The method of claim 1, wherein said step of preprogramming the real-time node computer further includes preprogramming the real-time node computer to download and transmit charge rate information for said current call, wherein said user phone terminal is capable of displaying said charge rate information for said current call on the display unit.

3. The method of claim 2, wherein said cumulative current billing period information is the amount of each grade of service used so far in said current billing period.

4. The method of claim 1, wherein said cumulative billing period information is the amount of each grade of service used so far in said current billing period.

6. A telephone billing management method for displaying information on at least one user phone terminal, each said user phone terminal having an associated display unit, said method comprising the steps of: preprogramming the at least one user phone terminal to receive cumulative current billing period information from a service provider; receiving said cumulative current billing period information from the service provider by the at least one user phone terminal during a two-way call set-up period; and displaying said received cumulative current billing period information on the display unit of the associated user phone terminal.

7. The method of claim 6, further comprising a step of preprogramming the user phone terminal to calculate and display air time and billing costs from said charge rate information for said current call, and further comprising calculating said air time and billing costs for said current call and displaying said air time and billing costs for said current call on the display unit.

8. The method of claim 7, wherein said cumulative current billing period information is the amount of each grade of service used so far in said current billing period.

10. The method of claim 6, wherein the display unit is located on a handset of the user phone terminal.

13. The method of claim 6, wherein the display unit is located on a cradle housing of the user phone terminal.

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L9: Entry 5 of 103 File: USPT Dec 17, 2002

DOCUMENT-IDENTIFIER: US 6496831 B1
TITLE: Real-time event processing system for telecommunications and other applications

Application Filing Date (1):
19990325

Brief Summary Text (2):
The present invention relates generally to real-time event processing, and more particularly to methods, apparatus and systems for processing real-time events in applications such as telecommunications and computer networks.

Brief Summary Text (4):
Many event-processing systems have real-time performance requirements that cannot be met by conventional general-purpose database management systems. In telecommunications applications, for example, a variety of adjunct switching services such as debit-based billing, number mapping, call forwarding, and local-number portability involve event processing during the critical call-connection phase of a telephone call. To meet the real-time requirements of the network, the service time for such events generally must not exceed a few milliseconds. However, with conventional database technology, the costs of invoking a structured query language (SQL) operation over a client-server interface, or the costs associated with a single access to secondary storage, can account for hundreds of milliseconds. As a consequence, performance goals on the order of a few milliseconds may already be unattainable even before the costs of the event processing logic are taken into account.

Brief Summary Text (11):
The invention can be used in conjunction with any event processing application, including, for example, telecommunications, electronic commerce, and Internet service provisioning applications. For example, in a telecommunications application, the invention can be configured to provide a basis for features such as enhanced billing systems, fraud detection and prevention, local-number portability, settlements among service providers and real-time traffic analysis.

Detailed Description Text (2):
FIG. 1 shows an illustrative embodiment of an information processing system 10 in accordance with the invention. The system 10 includes a real-time event processing system (EPS) 12, a data warehouse/enterprise store (DW/ES) 14 including archive data and disk-resident database system 15, a real-time component 16, and one or more applications 18, e.g., billing, fraud detection/prevention, etc. The real-time EPS 12 includes a main-memory database system 20, which may be, e.g., a DataBlitz.TM. system to be described in more detail below. The real-time EPS 12 processes events on behalf of the real-time component 16, which may be, e.g., a network switch, a service control point (SCP) or other element of a communication system or network, and maintains summary and aggregation data over those events.

Detailed Description Text (4):
The real-time EPS 12 in the illustrative embodiment requires space complexity to be bounded over any sequence of events, regardless of the number of events in the sequence. Although this assumption limits the class of processing that can be supported in the illustrative embodiment, other embodiments need not be subject to this assumption, i.e., the assumption is not a requirement of the invention. It should be noted that certain existing telecommunication pricing plans cannot be wholly realized within the illustrative embodiment of EPS 12 because they have unbounded

space complexity. For example, a pricing plan that awards a discount for the phone number a customer calls the most in a particular billing cycle has unbounded space complexity, because determining which number is called the most requires maintaining statistical information that grows with each new number called.

Detailed Description Text (28):
The SAE 24 is a tool for authoring the application-specific services, and embedding those services within the RAE 22. These services define: (1) the event-processing logic of a system; (2) the configuration, summary and aggregation information which is maintained to support event processing; (3) canned queries that can be invoked within a system; and (4) the input and output streams which interface the EPS 12 to existing data sources or sinks. Authoring is a high-level procedure based on a set of graphical user interfaces (GUIs) and a service authoring language (SAL). The services authored using the SAE 24 allow the EPS 12 to be applicable in a wide range of areas, including, e.g., billing systems, intelligent networks, Internet services, and network management. Possible specific applications in the telecommunications area include debit-based billing, fraud detection and prevention, call centers, hot billing, and adjunct switching services such as local-number portability and toll-free number mapping.

Detailed Description Text (29):
An example of a service which may be implemented in the EPS 12 is a debit-based billing system for telephone calls, where each customer has a pre-deposited balance. A callConnection event occurs whenever a call is placed. The goal of processing callConnection events is to establish a pre-approved duration for a call based on the customer's current balance. If sufficient funds are available, then a maximum pre-approved duration is determined. If insufficient funds are available, then a pre-approved duration of zero is assigned, and the call is effectively blocked. Upon call completion, a callCompletion event occurs, at which point the actual charges for a call are calculated, and debited from the customer's balance.

Detailed Description Text (30):
This type of debit-based billing system is closely coupled to the provisioning information and switching elements within a network, and must be highly available. Since callConnection events are processed during the critical connection phase of a telephone call, they must meet the real-time performance requirements of the network. These typically dictate that the response time for event processing must be on the order of only a few milliseconds.

Detailed Description Text (66):
Subscriptions are the linkages between an entity-based event that enters the EPS framework and the actions, i.e., services, that should be executed for that event. For example, in a telecommunications billing application, when a call complete event arrives, the billing plans in which the given customer is enrolled should be invoked appropriately. Not all events that enter the EPS framework are subscribed events, so it is important to appreciate the distinction between mapped events, i.e., mapped by customer to the appropriate cluster (see FIG. 11), and subscribed events. For example, priming data for a customer summary is a mapped event, because it must be routed to the appropriate cluster based on the customer ID, but the subscription logic is not relevant, so it is not a subscribed event.

Other Reference Publication (10):
J. Baulier et al., "A Database System for Real-Time Event Aggregation in Telecommunication," Proceedings of the 24th VLDB Conference, New York, USA, 3 pages, 1998.

Other Reference Publication (20):
Baulier et al. (A Database System for Real-Time Event Aggregation in Telecommunication, Proceedings of the 24th VLDB Conference, 1998, pp. 1-5).

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L14: Entry 14 of 53 File: USPT Sep 26, 2000

DOCUMENT-IDENTIFIER: US 6125173 A
TITLE: Customer profile based customized messaging

Abstract Text (1):
A method and system of telephone call processing that provides information to customers while telephone calls are made. Summary information for a customer is stored. A call from the customer is received alt a network switch. The network switch transmits information identifying the customer to a billing analysis system. The billing analysis system transmits the summary information for the customer to the network switch and an audio message based on the summary information is played to the customer.

Application Filing Date (1):
19970521

Brief Summary Text (2):
The present invention relates to the processing of telephone calls, and in particular, to the billing of the costs of such calls.

Brief Summary Text (4):
Discount telephone billing plans can save customers significant amounts of money. However, customers must know about such plans before they can subscribe to them. While advertising is useful in informing customers about discount plans, advertisements lack proximity to telephone calls made by customers. It would be useful to inform customers about discount billing plans at the time telephone calls are made.

Brief Summary Text (6):
The present invention is a method and system of telephone call processing that provides information to customers while telephone calls are made. The information is provided in the form an audio message that is played to the customer during call setup. The information may include actual and exemplary customer account information, such as the customer's account balance, exemplary balance under an exemplary discount billing plan, saving under an exemplary discount billing plan, etc.

Drawing Description Text (3):
FIG. 1a is a block diagram of one embodiment of a telephone call billing system, in which the present invention may be implemented.

Drawing Description Text (4):
FIG. 1b is a block diagram of the telephone call billing system of FIG. 1a, showing a customer profile including summary parameters according to the present invention.

Drawing Description Text (7):
FIG. 3 is a block diagram of another embodiment of a telephone call billing system, in which the present invention may be implemented.

Drawing Description Text (8):
FIG. 4 is a block diagram of another embodiment of a telephone call billing system, in which the present invention may be implemented.

Detailed Description Text (2):
Referring to FIG. 1a, there is shown a block diagram of a telephone system in accordance with one embodiment of the present invention. There is shown a calling

telephone 102, a called telephone 104, a telephone network switch 106 and a Call Detail Database (CDD) 108. An Automatic Message Accounting (AMA) record, represented by a block 110, is also shown. As indicated by the figure, a billable call may be initiated at telephone 102 and routed through switch 106, e.g., an AT&T 4ESS switch, to telephone 104. The switch generates AMA record 110, which includes the information necessary to rate the call. The AMA record is passed to CDD 108. It should be noted here that there are an abundance of protocols and transmission media that may be used for passing the data from the switch to the CDD. For example, suitable protocols include the well known File Transfer Protocol (FTP) and Transmission Control Protocol/Internet Protocol; and suitable transmission media include twisted shielded pair wires, fiber optic lines, coaxial cable, and wireless links. Moreover, these protocols and media are suitable for use in all data transfers and queries hereinafter described.

Detailed Description Text (4):
The billing analysis system performs its functions the instant the switch passes the AMA record to the CDD (i.e. it performs call pricing in real-time). In order to achieve real-time processing of AMA records the invention must overcome two primary obstacles. First, the customer specific data is fragmented across multiple business units, with no cohesive notion of an integrated customer profile. This situation is depicted in FIG. 1a, which shows several customer profile databases 114, 116 and 118. As shown in the figure, the invention overcomes this obstacle through the use of an integrated customer profile database located within the billing analysis system. Software tools update the integrated customer profile database in response to updates of the individual customer profiles 114, 116 and 118 so that the integrated database always contains current information on all customers.

Detailed Description Text (5):
The volume of customer and telephone call data makes it difficult to store, rate, and query call data in real-time. To surmount this obstacle the invention accumulates summary information as each individual call (AMA) record is received and rated in real-time. It is generally desirable for a telephone network to maintain a customer's current bill. Thus, one type of accumulated summary information may be current bills for each network customer. Nevertheless, it may be useful to accumulate other types of summary information for particular customers. The nature of the accumulated summary information for a particular customer depends upon the services subscribed to by that customer.

Detailed Description Text (8):
One use for real-time access to summary information involves call setup query 119. When a call is initiated, for example, by telephone station 102, and routed to network switch 106, before the call is connected to the destination station, for example, station 104, switch 106 may transmit a call setup query 119 to billing analysis system 112. The call setup query includes information identifying the customer that placed the call and may also include other information. Typically the Automatic Number Identification (ANI) is used for this purpose. In an ANI system, the number of the telephone station from which a call is initiated is determined and used to identify the party who initiated the call. In response to receiving query 119, billing analysis system 112 may access summary information stored in SD 113 and generate a call setup response 120 based on the summary information.

Detailed Description Text (9):
The processing involved in customer profile based customized messaging is shown in FIG. 1b, which, as an example, shows the present invention implemented in the telephone billing system of FIG. 1a. The present invention may be similarly implemented in the telephone billing systems shown in FIGS. 3 and 4.

Detailed Description Text (10):
The processing involved in customer profile based customized messaging includes two phases: the call setup phase and the call completion phase. The call completion phase begins once a billable call has occurred. Typically, a billable call occurs once a call has been completed from a calling station to a destination station, for example from calling station 152 to destination station 153. Once a billable call occurs, network switch 154 generates a corresponding AMA record 155. The AMA record includes an indication of the customer that placed the call. Typically the Automatic Number

Identification (ANI) is used for this purpose. Each AMA record is passed to CDD 156, making the record available for call pricing. Each AMA record is passed from CDD 156 to billing analysis system 157, which applies the customer specific billing parameters contained in the attached customer profile database, such as database 158. The billing analysis system 157 then generates updates to summary information stored in the summary database (SD) 159 based on the customer profile 160 stored in customer profile database 158. The updates to the summary information are generated in real-time as calls are placed and AMA records generated. Updated summary information is available for access immediately after a summary information update is entered into SD 159. Thus, updated summary information may be accessed whenever desired. For example, a bill may be generated in real-time upon demand of a customer. Summary information stored in SD 159 may also be made available to customers without generating a bill. Snapshot summaries, of the current status of the customer's account, may be generated.

Detailed Description Text (11):
Customer profile 160 includes pricing data 161 that is used to price each telephone call and summary parameters 162 that define the summary information that is generated for the customer. Customer profile 160 may also include message parameters 163 that specify summary information that is to be included in the audio message played to the customer.

Detailed Description Text (12):
Pricing data 161 includes parameters specifying how the price of each telephone call is to be determined, based on the telephone billing plans to which the customer subscribes. The priced call value is used to generate updated summary information, such as total telephone usage for the billing period. Summary information may be also be compiled based on other aspects of the subscribed telephone billing plan, as defined by summary parameters 162, such as the total cost of calls made to each of a given set of numbers, area codes, cities, states, countries, etc., on the time or cost of calls in one or more discount plans, or based on the type of calls made, such as collect calls, etc.

Detailed Description Text (23):
Several well known techniques can be used to match the rated call to the customer. One such technique uses Automatic Number Identification (ANI). In an ANI system, the number of the telephone station from which a call is initiated is determined and used to identify the party who initiated the call. Accordingly, in the FIG. 1b embodiment, the number of a telephone, such as 152 may be determined and passed to the billing analysis system along with the AMA record. The billing analysis system may then cross-reference the number to the customer profile containing the customer specific data to be used for the current call. For example, AMA record 155 is cross-referenced to customer profile 160, which also relates to that customer. Customer profile 160 contains customer specific pricing data 161 that is used to price the call, as well as summary parameters 162 that define the summary information that is to be generated. Once the appropriate profile, or profiles, if there are multiple customer profile databases, have been determined, then in step 218, the billing analysis system applies the pricing data contained in the profiles to the rated call to produce a priced call value. In step 220, the billing analysis system generates summary information updates defined by the summary parameters based on the priced call value. In step 224, the priced call value (processed AMA record) is stored in the CDD and the summary information update for the customer is stored in the SD. Once the summary information update is stored, the updated summary information is available for use in call setup processing, as shown in FIG. 2a.

Detailed Description Text (25):
Referring now to FIG. 2c, an exemplary format of a call setup response 165 is shown. Response 165 includes a header, which identifies the response 165 as a call setup response. Response 165 also includes one or more entries, such as entries 204a-z. Each entry includes an entry identifier, such as identifiers 206a-z, and entry contents, such as contents 208a-z. The entry identifier identifies the entry contents. In an example shown in FIG. 2b, entry identifier 206a indicates that the entry contents represent the savings the customer would have had during the current billing period if the customer subscribed to calling plan A. The entry contents 208a are the indicated savings, here, $2.07. Voice messaging unit (VMU) 166 generates a message communicating

the indicated information, such as:

Detailed Description Text (26):
"You would have saved $2.07 this billing period if you subscribed to billing plan A. For more information about this or other billing plans, please call 1-800-555-5555."

Detailed Description Text (30):
The information included in call setup response 165 may relate to any summary or exemplary information that may be generated by billing analysis system 157. For example, information or exemplary information relating to account balances, total usage, total billing plan usage, usage during a billing or promotional period, billing plan usage during a billing or promotional period, total savings, savings during a billing or promotional period, etc., may be generated and included. Other information, such as promotional information about products and services, ordering information and ordering telephone numbers, etc., may also be provided. The generated and included information may be selected by the telephone network operator or by the customer.

Detailed Description Text (31):
Referring now to FIG. 3, there is shown an alternative embodiment of a telephone system in accordance with the present invention. The customer profiles are not shown, but are similar to those shown in FIG. 1b. As shown in the figure, a call may be initiated at a first telephone 302 and directed to a second telephone 304. The call is routed by a network switch 306, which generates an AMA record 310 for the call. The AMA record is passed to a billing analysis system 312 which applies customer specific pricing data to the AMA record to produce a processed AMA record. The AMA record and processed AMA record are then passed to a CDD 308 for storage.

Detailed Description Text (33):
FIG. 4 shows another embodiment of a telephone system in accordance with the present invention. The customer profiles are not shown, but are similar to those shown in FIG. 1b. In the FIG. 4 embodiment, as in the previous embodiments, a call initiated at a first telephone 402 may be directed to a second telephone 404 through a network switch 406, which generates an AMA record 410. However, in the FIG. 4 embodiment the AMA record is passed to a Rating Complex (RC) 412. The RC is a unit which performs the functions of the CDD and billing analysis system, and may therefore be characterized as a combined CDD and billing analysis system. As shown in the figure, the RC may include a SD 413 for storing the summary information separately from the AMA records and processed AMA records. As in the prior described embodiments, alternative schemes may be employed for the storage of the AMA records, processed AMA records, and summary information.

Detailed Description Text (34):
It should be noted that although all three embodiments discussed above depict a call as being initiated from a first telephone and directed to a second telephone, it is possible that calls may be initiated by, and directed to, many different types of communication devices. For example, a call may be initiated by a fax machine and directed to a personal computer. Moreover, a call may be initiated by a single communication device and directed to multiple communication devices. For example, a call may be initiated by a fax machine and directed to multiple independent personal computers. For purposes of this description, each instance of a single initiating call being directed to a different terminating device will be considered an independent call.

CLAIMS:

1. A method of telephone call processing comprising the steps of:

storing summary parameters that define summary information that is to be generated for a customer;

storing summary information for the customer, the summary information comprising exemplary summary information relating to a telephone billing plan other than a current telephone billing plan of the customer the summary information generated as specified by the summary parameters and accumulated as calls are placed by the customer and rated in real-time

receiving a call from the customer at a network switch; and

during a call setup phase, before the call has been completed to a destination station, performing the steps of:

transmitting information identifying the customer to a billing analysis system,

transmitting the summary information for the customer, including the exemplary summary information, to the network switch, and

transmitting the summary information, including the exemplary summary information, to the customer.

3. The method of claim 1, wherein the exemplary information comprises exemplary usage based on a telephone billing plan.

6. The method of claim 1, wherein the summary information includes actual summary information and exemplary summary information and the storing step comprises the steps of:

generating actual summary information for the customer based on a current telephone billing plan of the customer;

generating exemplary summary information for the customer based on an exemplary telephone billing plan; and

storing the summary information for the customer.

7. The method of claim 6, wherein the exemplary summary information comprises:

an exemplary balance for the customer based on the exemplary telephone billing plan.

8. The method of claim 6, wherein the exemplary summary information comprises:

a difference between an actual balance of the customer and an exemplary balance for the customer based on the exemplary telephone billing plan.

9. A system for telephone call processing comprising:

a database storing summary parameters that define summary information that is to be generated for a customer and summary information for the customer, the summary information comprising exemplary summary information relating to a telephone billing plan other than a current telephone billing plan of the customer, the summary information generated as specified by the summary parameters and accumulated as calls are placed by the customer and rated in real-time;

a network switch receiving a call from the customer and, during a call setup phase, before the call has been completed to a destination station, transmitting information identifying the customer to a billing analysis system;

a billing analysis system, during the call setup phase, before the call has been completed to the destination station, accessing the database to obtain the summary information for the customer and transmitting the summary information, including the exemplary summary information, to the network switch; and

a device, coupled to the network switch, during the call setup phase, before the call has been completed to the destination station, transmitting the exemplary summary information, including the exemplary summary information, to the customer.

11. The system of claim 9, wherein the exemplary summary information comprises exemplary usage based on a telephone billing plan.

14. The system of claim 9, wherein the summary information includes actual summary information and exemplary summary information and the billing analysis system further:

generates actual summary information for the customer based on a current telephone billing plan of the customer;

generates exemplary summary information for the customer based on an exemplary telephone billing plan; and

transmits the summary information for the customer to the database for storage.

15. The system of claim 13, wherein the exemplary summary information comprises:

an exemplary balance for the customer based on the exemplary telephone billing plan.

16. The system of claim 14, wherein the exemplary information comprises:

a difference between an actual balance of the customer and an exemplary balance for the customer based on the exemplary telephone billing plan.

17. A system for telephone call processing comprising:

means for storing summary parameters that define summary information that is to be generated for a customer;

means for storing summary information for the customer, the summary information comprising exemplary summary information relating to a telephone billing plan other than a current telephone billing plan of the customer, the summary information generated as specified by the summary parameters and accumulated as calls are placed by the customer and rated in real-time;

means for receiving a call from the customer and, during the call setup phase, before the call has been completed to the destination station, transmitting information identifying the customer;

means for, during the call setup phase, before the call has been completed to the destination station, receiving the information identifying the customer, accessing the stored summary information for the customer and transmitting the summary information, including the exemplary summary information; and

means for, during the call setup phase, before the call has been completed to the destination station, receiving the summary information, including the exemplary summary information, and transmitting the summary information to the customer.

18. The system of claim 17, wherein the exemplary summary information comprises exemplary usage based on a telephone billing plan.

21. The system of claim 17, wherein the summary information includes actual summary information and exemplary summary information and the storing means comprises:

means for generating actual summary information for the customer based on a current telephone billing plan of the customer; and

means for generating exemplary summary information for the customer based on an exemplary telephone billing plan.

22. The system of claim 20, wherein the exemplary summary information comprises:

an exemplary balance for the customer based on the exemplary telephone billing plan.

23. The system of claim 20, wherein the exemplary information comprises:

a difference between an actual balance of the customer and an exemplary balance for the customer based on the exemplary telephone billing plan.

25. A method of telephone call processing comprising the steps of:

storing summary parameters that define summary information that is to be generated for a customer;

generating actual summary information for the customer based on a current telephone billing plan of the customer, including actual usage, the actual summary information generated as specified by the summary parameters and accumulated as calls are placed by the customer and rated in real-time;

generating exemplary summary information for the customer based on an exemplary telephone billing plan other than a current telephone billing plan of the customer, including an exemplary balance for the customer based on the exemplary telephone billing plan and a difference between an actual balance of the customer and an exemplary balance for the customer based on the exemplary telephone billing plan, the exemplary summary information generated as specified by the summary parameters and accumulated as calls are placed by the customer and rated in real-time;

storing the summary information for the customer;

receiving a call from the customer at a network switch; and

during a call setup phase, before the call has been completed to a destination station, performing the steps of:

transmitting information identifying the customer to a billing analysis system,

transmitting the summary information for the customer, including the exemplary summary information, to the network switch, and

transmitting the summary information, including the exemplary summary information, to the customer by playing an audio message based on the exemplary summary information to the customer.

26. A system for telephone call processing comprising:

a database storing summary parameters that define summary information that is to be generated for a customer and summary information for the customer, the summary information comprising exemplary summary information for the customer based on an exemplary telephone billing plan other than a current telephone billing plan of the customer, including an exemplary balance for the customer based on the exemplary telephone billing plan and a difference between an actual balance of the customer and an exemplary balance for the customer based on the exemplary telephone billing plan and actual summary information for the customer based on a current telephone billing plan of the customer, including actual usage, the exemplary summary information and the actual summary information generated as specified by the summary parameters and accumulated as calls are placed by the customer and rated in real-time;

a network switch receiving a call from the customer and, during a call setup phase, before the call has been completed to a destination station, transmitting information identifying the customer to a billing analysis system;

a billing analysis system, during the call setup phase, before the call has been completed to the destination station, accessing the database to obtain the summary information for the customer and transmitting the summary information, including the exemplary summary information, to the network switch; and

a device, coupled to the network switch, during the call setup phase, before the call has been completed to the destination station, transmitting the exemplary summary information, including the exemplary summary information, to the customer by playing an audio message based on the exemplary summary information to the customer.

27. A system for telephone call processing comprising:

means for storing summary parameters that define summary information that is to be generated for a customer;

means for generating actual summary information for the customer based on a current telephone billing plan of the customer, including actual usage, the actual summary information generated as specified by the summary parameters and accumulated as calls are placed by the customer and rated in real-time;

means for generating exemplary summary information for the customer based on an exemplary telephone billing plan other than a current telephone billing plan of the customer, including an exemplary balance for the customer based on the exemplary telephone billing plan and a difference between an actual balance of the customer and an exemplary balance for the customer based on the exemplary telephone billing plan, , the exemplary summary information generated as specified by the summary parameters and accumulated as calls are placed by the customer and rated in real-time;

means for storing the summary information for the customer;

means for receiving a call from the customer and, during the call setup phase, before the call has been completed to the destination station, transmitting information identifying the customer;

means for, during the call setup phase, before the call has been completed to the destination station, receiving the information identifying the customer, accessing the stored summary information for the customer and transmitting the summary information, including the exemplary summary information; and

means for, during the call setup phase, before the call has been completed to the destination station, receiving the summary information, including the exemplary summary information, and transmitting the summary information to the customer by playing an audio message based on the exemplary summary information to the customer.

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L14: Entry 13 of 53 File: USPT Jan 9, 2001

DOCUMENT-IDENTIFIER: US 6173046 B1
TITLE: Customer group billing

Application Filing Date (1):
19970227

Brief Summary Text (2):
The present invention relates to a system and method for group billing of telephone service customers having separate billing accounts.

Brief Summary Text (4):
Discount telephone billing plans have become commonplace. In a typical plan, a customer receives a discount on all calls made if total usage exceeds a predefined time or monetary limit. Such discount billing plans have been extended to organizational customers, such as companies and universities, which have multiple individuals placing calls, but which have only one billing account. Groups of customers who have separate billing accounts have been unable to participate in discount billing plans as a group because there is no way that calls made by such customers can be priced based on the group calling plan and on the usage by other members of the group.

Drawing Description Text (3):
FIG. 1a is a block diagram of one embodiment a telephone call billing system, in which the present invention may be implemented.

Drawing Description Text (4):
FIG. 1b is a block diagram of the telephone call billing system of FIG. 1a, showing a customer profile database according to the present invention.

Drawing Description Text (6):
FIG. 3 is a block diagram of another embodiment a telephone call billing system, in which the present invention may be implemented.

Drawing Description Text (7):
FIG. 4 is a block diagram of another embodiment a telephone call billing system, in which the present invention may be implemented.

Detailed Description Text (2):
Referring to FIG. 1a , there is shown a block diagram of a telephone system in accordance with one embodiment of the present invention. There is shown a calling telephone 102, a called telephone 104, a telephone network switch 106 and a Call Detail Database (CDD) 108. An Automatic Message Accounting (AMA) record, represented by a block 110, is also shown. As indicated by the figure, a billable call may be initiated at telephone 102 and routed through switch 106, e.g., an AT&T 4ESS.RTM. switch, to telephone 104. The switch generates AMA record 110, which includes the information necessary to rate the call. The AMA record is passed to CDD 108. It should be noted here that there are an abundance of protocols and transmission media that may be used for passing the data from the switch to the CDD. For example, suitable protocols include the well known File Transfer Protocol (FTP) and Transmission Control Protocol/Internet Protocol; and suitable transmission media include twisted shielded pair wires, fiber optic lines, coaxial cable, and wireless links. Moreover, these protocols and media are suitable for use in all data transfers and queries hereinafter described.

Detailed Description Text (4):
The billing analysis system performs its functions the instant the switch passes the AMA record to the CDD (i.e. it performs call pricing in real-time). In order to achieve real-time processing of AMA records the invention must overcome two primary obstacles. First, the customer specific data is fragmented across multiple business units, with no cohesive notion of an integrated customer profile. This situation is depicted in FIG. 1a, which shows several customer profile databases 114, 116 and 118. As shown in the figure, the invention overcomes this obstacle through the use of an integrated customer profile database located within the billing analysis system. Software tools update the integrated customer profile database in response to updates of the individual customer profiles 114, 116 and 118 so that the integrated database always contains current information on all customers.

Detailed Description Text (5):
The volume of customer and telephone call data makes it difficult to store, rate, and query call data in real-time. To surmount this obstacle the invention accumulates summary information as each individual call (AMA) record is received and rated in real-time. It is generally desirable for a telephone network to maintain a customer's current bill. Thus, one type of accumulated summary information may be current bills for each network customer. Nevertheless, it may be useful to accumulate other types of summary information for particular customers. The nature of the accumulated summary information for a particular customer depends upon the services subscribed to by that customer. For example, a customer may subscribe to a plan in which calls made during the hours between 5:00 pm and 9:00 am receive a 10% discount; in which case it is useful to maintain a summary field containing the number of minutes of calls that the customer has made during the discount period.

Detailed Description Text (7):
The processing involved in customer group billing is shown in FIG. 1b, which, as an example, shows the present invention implemented in the telephone billing system of FIG. 1a. The present invention may be similarly implemented in the telephone billing systems shown in FIGS. 3 and 4.

Detailed Description Text (8):
Customers belonging to a particular customer group place calls from calling stations 152a-c, which have been registered in the group. Each call is routed through a network switch 156, which generates a corresponding AMA record 160a-c. Each AMA record includes an indication of the customer that placed the call. Typically the Automatic Number Identification (ANI) is used for this purpose. In an ANI system, the number of the telephone station from which a call is initiated is determined and used to identify the party who initiated the call. Each AMA record is passed to CDD 158, making the record available for call pricing. Each AMA record is passed from CDD 158 to billing analysis system 162, which applies the customer specific billing parameters contained in the attached customer profile database, such as database 164.

Detailed Description Text (12):
Upon receiving an AMA record, such as 160a from CDD 158, the first step billing analysis system 162 takes is to rate the call (step 202). It must then match the rated call to the customer (step 204) so that customer specific parameters can be applied to the call. Several well known techniques can be used to match the rated call to the customer. One such technique uses Automatic Number Identification (ANI). In an ANI system, the number of the telephone station from which a call is initiated is determined and used to identify the party who initiated the call. Accordingly, in the FIG. 1b embodiment, the number of a telephone, such as 152a may be determined and passed to the billing analysis system along with the AMA record. The billing analysis system may then cross-reference the number to the customer profile containing the customer specific data to be used for the current call. For example, AMA record 160a, which relates to customer A, is cross-referenced to customer profile 167, which also relates to customer A. Customer profile 167 indicates that customer A is a member of group 1, so customer profile 166, which relates to group 1, is also cross-referenced. Once the appropriate profiles have been determined, the billing analysis system applies the customer and group specific data contained in the profiles to the rated call to produce a priced call value (step 206). The priced call value may be added to the customer's previous balance to create a new balance, or "current bill" (step 208).

The priced call value may also be added to the group's previous balance to create a new balance for the group. Finally, the priced call value (processed AMA record) for the customer is stored in the CDD, and the current bill (summary information) for both the customer and the group is stored in the SD (step 212). The group is treated as a separate customer from any members of the group and the group's AMA record set is the union of AMA records for all customers in the group. As described in relation to FIG. 1a, an alternative scheme is to store both the priced call value and current bill--collectively termed "the priced call data"--in the SD; in which case, step 212 would involve storing the priced call value and the current bill in the SD.

Detailed Description Text (13):
As an optional step in the procedure of FIG. 2, the billing analysis system may adjust charges for old calls to reflect certain types of billing plans (step 210). For example, a customer may subscribe to a plan in which the customer receives a conditional 10% discount on all calls, the condition being that the customer exceed $50.00 in total charges for a given billing period. In such a scenario, calls will initially be billed at the full rate, until such time that the customer reaches $50.00 in total charges. Thus, if the customer does reach $50.00 before the end of the billing period, not only will successive calls need to be discounted by 10%, but all previous calls will need to be discounted by 10%. This requires that prices generated for the previous calls be retroactively adjusted.

Detailed Description Text (14):
In step 210, the billing analysis system may adjust charges for old calls for the customer based on the total group charges for a given billing period. This is possible because the group balance is available to the billing analysis system. The billing analysis system may also adjust charges for all members of the group based on the total group charges for a given billing period. The group is treated as a separate customer and the group's AMA record set, which is the union of the AMA records of all customers in the group, may be adjusted as for any other customer. For example, all members of a group may received a 10% discount once total group usage reaches $1000.00. All successive calls made by group members will receive a 10% discount and prices generated for previous calls made by group members will be retroactively adjusted.

Detailed Description Text (15):
Referring now to FIG. 3, there is shown an alternative embodiment of a telephone system in accordance with the present invention. The customer profiles are not shown, but are similar to those shown in FIG. 1b. As shown in the figure, a call may be initiated at a first telephone 302 and directed to a second telephone 304. The call is routed by a network switch 306, which generates an AMA record 310 for the call. The AMA record is passed to a billing analysis system 312 which applies customer specific parameters to the AMA record to produce a processed AMA record. The AMA record and processed AMA record are then passed to a CDD 308 for storage.

Detailed Description Text (17):
FIG. 4 shows another embodiment of a telephone system in accordance with the present invention. The customer profiles are not shown, but are similar to those shown in FIG. 1b. In the FIG. 4 embodiment, as in the previous embodiments, a call initiated at a first telephone 402 may be directed to a second telephone 404 through a network switch 406, which generates an AMA record 410. However, in the FIG. 4 embodiment the AMA record is passed to a Rating Complex (RC) 412. The RC is a unit which performs the functions of the CDD and billing analysis system, and may therefore be characterized as a combined CDD and billing analysis system. As shown in the figure, the RC may include a SD 413 for storing the summary information separately from the AMA records and processed AMA records. As in the prior described embodiments, alternative schemes may be employed for the storage of the AMA records, processed AMA records, and summary information.

Detailed Description Text (18):
It should be noted that although all three embodiments discussed above depict a call as being initiated from a first telephone and directed to a second telephone, it is possible that calls may be initiated by, and directed to, many different types of communication devices. For example, a call may be initiated by a fax machine and directed to a personal computer. Moreover, a call may be initiated by a single

communication device and directed to multiple communication devices. For example, a call may be initiated by a fax machine and directed to multiple independent personal computers. For purposes of this description, each instance of a single initiating call being directed to a different terminating device will be considered an independent call.

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L16: Entry 13 of 21 File: USPT Jun 22, 1999

DOCUMENT-IDENTIFIER: US 5915006 A
TITLE: Telephone line aggregated billing

Abstract Text (1):
A method and system in which calls made on two or more phone lines of a customer are aggregated for billing and discount billing plans to which the customer subscribes are applied to the aggregated phone usage of the customer. In order to price a call made over a network by a customer of the network, information specifying a billing plan of the customer and information specifying a plurality of telephone lines to which the billing plan applies are stored. A call made from one of the plurality of telephone lines is received at a network switch and record that describes the call is generated. The record is received at a billing analysis system and a priced call value for the call is determined based on the record and the information specifying the customer billing plan. The record that describes the call comprises an identifier of the telephone line from which the call was made and priced call value for the call is determined by accessing the information specifying the customer billing plan using the identifier in the received record.

Application Filing Date (1):
19970501

Brief Summary Text (2):
The present invention relates to the processing of telephone calls, and in particular, to the billing of the costs of such calls.

Brief Summary Text (4):
Discount telephone billing plans have become commonplace. In a typical plan, a customer receives a discount on all calls made if total usage exceeds a predefined time or monetary limit. However, such billing plans apply separately to individual phone lines. Thus, a customer with several individual phone lines must subscribe separately to a billing plan for each line, and must qualify for any discount separately on each phone line. It would be useful if a customer could aggregate usage on two or more phone lines at the same or different addresses, so as to receive greater benefits from a discount calling plan.

Brief Summary Text (6):
The present invention is a method and system in which calls made on two or more phone lines of a customer are aggregated for billing. Thus, any discount billing plans to which the customer subscribes are applied to the aggregated phone usage of the customer.

Brief Summary Text (7):
In order to price a call made over a network by a customer of the network, according to the present invention, information specifying a billing plan of the customer and information specifying a plurality of telephone lines to which the billing plan applies are stored. A call made from one of the plurality of telephone lines is received at a network switch and a record that describes the call is generated. The record is received at a billing analysis system and a priced call value for the call is determined based on the record and the information specifying the customer billing plan. The record that describes the call comprises an identifier of the telephone line from which the call was made and the priced call value for the call is determined by accessing the information specifying the customer billing plan using the identifier in the received record.

Drawing Description Text (3):
FIG. 1a is a block diagram of one embodiment a telephone call billing system, in which the present invention may be implemented.

Drawing Description Text (4):
FIG. 1b is a block diagram of the telephone call billing system of FIG. 1a, showing a customer profile database according to the present invention.

Drawing Description Text (6):
FIG. 3 is a block diagram of another embodiment a telephone call billing system, in which the present invention may be implemented.

Drawing Description Text (7):
FIG. 4 is a block diagram of another embodiment a telephone call billing system, in which the present invention may be implemented.

Detailed Description Text (2):
Referring to FIG. 1a, there is shown a block diagram of a telephone system in accordance with one embodiment of the present invention. There is shown a calling telephone 102, a called telephone 104, a telephone network switch 106 and a Call Detail Database (CDD) 108. An Automatic Message Accounting (AMA) record, represented by a block 110, is also shown. As indicated by the figure, a billable call may be initiated at telephone 102 and routed through switch 106, e.g., an AT&T 4ESS.RTM. switch, to telephone 104. The switch generates AMA record 110, which includes the information necessary to rate the call. The AMA record is passed to CDD 108. It should be noted here that there are an abundance of protocols and transmission media that may be used for passing the data from the switch to the CDD. For example, suitable protocols include the well known File Transfer Protocol (FTP) and Transmission Control Protocol/Internet Protocol; and suitable transmission media include twisted shielded pair wires, fiber optic lines, coaxial cable, and wireless links. Moreover, these protocols and media are suitable for use in all data transfers and queries hereinafter described.

Detailed Description Text (4):
The billing analysis system performs its functions the instant the switch passes the AMA record to the CDD (i.e. it performs call pricing in real-time). In order to achieve real-time processing of AMA records, the invention must overcome two primary obstacles. First, the customer specific data is fragmented across multiple business units, with no cohesive notion of an integrated customer profile. This situation is depicted in FIG. 1a, which shows several customer profile databases 114, 116 and 118. As shown in the figure, the invention overcomes this obstacle through the use of an integrated customer profile database located within the billing analysis system. Software tools update the integrated customer profile database in response to updates of the individual customer profiles 114, 116 and 118 so that the integrated database always contains current information on all customers.

Detailed Description Text (5):
The volume of customer and telephone call data makes it difficult to store, rate, and query call data in real-time. To surmount this obstacle the invention accumulates summary information as each individual call (AMA) record is received and rated in real-time. It is generally desirable for a telephone network to maintain a customer's current bill. Thus, one type of accumulated summary information may be current bills for each network customer. Nevertheless, it may be useful to accumulate other types of summary information for particular customers. The nature of the accumulated summary information for a particular customer depends upon the services subscribed to by that customer. For example, a customer may subscribe to a plan in which calls made during the hours between 5:00pm and 9:00am receive a 10% discount; in which case it is useful to maintain a summary field containing the number of minutes of calls that the customer has made during the discount period.

Detailed Description Text (7):
The processing involved in customer group billing is shown in FIG. 1b, which, as an example, shows the present invention implemented in the telephone billing system of FIG. 1a. The present invention may be similarly implemented in the telephone billing

systems shown in FIGS. 3 and 4.

Detailed Description Text (8):
A customer who has more than one telephone line, such as the telephone lines represented by telephone stations 152a-c, may place a call from any of those lines. Each call is routed through a network switch 156, which generates a corresponding AMA record 160a-c. Although in FIG. 1b multiple telephone lines are shown connected to one switch, this arrangement is only an example. The telephone lines included in the present invention may be geographically separated and connected to the same or different switches in any combination.

Detailed Description Text (9):
Each AMA record generated by a network switch, such as switch 160, includes an identifier of the customer that placed the call and the line on which the call was placed. Typically the Automatic Number Identification (ANI) is used for this purpose. In an ANI system, the number of the telephone line from which a call is initiated is determined and used to also identify the party who initiated the call. Each AMA record is passed to CDD 158, making the record available for call pricing. Each AMA record is passed from CDD 158 to billing analysis system 162, which applies the customer specific billing parameters contained in the attached customer profile database, such as database 164 or database 165.

Detailed Description Text (10):
In the embodiment of customer profile database 164, each customer has two or more customer profiles, each accessed using a different customer identifier. Each customer profile corresponds to a different telephone line that the customer has registered for participation in aggregated billing. In this example, customer profile 166 is accessed using the ANI of line A, station 152a, as the customer identifier, customer profile 167 is accessed using the ANI of line B, station 152b, as the customer identifier and customer profile 168 is accessed using the ANI of line C, station 152c, as the customer identifier.

Detailed Description Text (11):
In the embodiment of customer profile database 165, each customer has only one customer profile, but the profile may be accessed using two or more different customer identifiers. Each identifier corresponds to a different telephone line that the customer has registered for participation in aggregated billing. In this 15 example, customer profile 165 may be accessed using the ANI of either line A, B, or C, stations 152a-c, as the customer identifier.

Detailed Description Text (12):
Each customer profile includes billing parameters that indicate billing actions to be taken for that customer. The billing parameters are defined based on the customer's subscribed calling plans. For example, a customer profile may include a discount parameter indicating that the customer is to receive a discount of 10% once the customer's total usage reaches $50.00. In the embodiment of customer profile database 165, there is only one set of billing parameters that is applied to all calls made by the customer, regardless of which of the customer's lines was used to make the call. Thus, in this embodiment, a customer's subscribed calling plans are automatically applied to calls the customer makes using any line registered for participation in aggregated billing.

Detailed Description Text (13):
In the embodiment of customer profile database 164, there are two or more distinct customer profiles for each customer. Thus, it is possible for each of the customer profiles to contain different billing parameters, causing calls made using each telephone line to be priced differently. However, in the present invention, all customer profiles corresponding to each customer indicate that a common billing plan has also been chosen, based on the customer's subscribed calling plans. Thus, in this embodiment, a customer's subscribed common calling plans are also applied to calls the customer makes using any line registered for participation in aggregated billing.

Detailed Description Text (14):
In the prior art, the billing management of multiple telephone lines belonging to a single customer depended upon the local arrangement of those lines. Those telephone

lines that were combined into a single local telephone account were subject to the same billing plan. There was no capability to apply different billing plans to different lines. Those telephone lines that had different accounts, whether with the same local carrier, or whether with different local carriers, were subject to separate billing plans. There was no capability to apply the same billing plan or aggregate billing.

Detailed Description Text (15):
By contrast, in the present invention, billing management for each telephone line is based on the defined customer profile for that line and may be flexibly defined as desired by the customer. For example, telephone lines that have a single local account may have different billing plans applied, by defining different billing plans the customer profile corresponding to each line. Likewise, telephone lines having different accounts may have the same billing plan applied, by defining the same billing plan in the customer profile corresponding to each line. In the present invention, telephone lines may be combined or separated in any desired arrangement, for application of billing plans.

Detailed Description Text (16):
FIG. 2 shows, in flowchart form, a procedure that a billing analysis system may use to perform telephone line aggregated billing processing for each call. In the following description of the flowchart references will be made to the embodiment shown in FIG. 1b.

Detailed Description Text (17):
Upon receiving an AMA record, such as 160a-c from CDD 158, the first step billing analysis system 162 takes is to rate the call (step 202). It must then match the rated call to the customer (step 204) so that customer specific parameters can be applied to the call. Several well known techniques can be used to match the rated call to the customer. One such technique uses Automatic Number Identification (ANI). In an ANI system, the number of the telephone line from which a call is initiated is determined and used to also identify the party who initiated the call.

Detailed Description Text (18):
Accordingly, in the FIG. 1b embodiment, the number of a telephone line, such as the line of station 152a may be determined and passed to the billing analysis system along with the AMA record. The billing analysis system may then cross-reference the number to the customer profile containing the customer specific data to be used for the current call. For example, AMA record 160a, which relates to the line A, is cross-referenced to customer profile 166 (in the embodiment of customer profile database 164), which also relates to line A. Once the appropriate profile has been determined, the billing analysis system applies the billing parameters contained in profile 166 to the rated call to produce a priced call value (step 206). Similar processing, using the appropriate profiles, is applied to calls placed from the customer's other registered telephone lines, such as the lines of stations 152b and 152c.

Detailed Description Text (21):
As an optional step in the procedure of FIG. 2, the billing analysis system may adjust charges for old calls to reflect certain types of billing plans (step 210). For example, a customer may subscribe to a plan in which the customer receives a conditional 10% discount on all calls, the condition being that the customer exceed $50.00 in total charges for a given billing period. In such a scenario, calls will initially be billed at the full rate, until such time that the customer reaches $50.00 in total charges. Thus, if the customer does reach $50.00 before the end of the billing period, not only will successive calls need to be discounted by 10%, but all previous calls will need to be discounted by 10%. This requires that prices generated for the previous calls be retroactively adjusted.

Detailed Description Text (22):
Referring now to FIG. 3, there is shown an alternative embodiment of a telephone system in accordance with the present invention. The customer profiles are not shown, but are similar to those shown in FIG. 1b. As shown in the figure, a call may be initiated at a first telephone 302 and directed to a second telephone 304. The call is routed by a network switch 306, which generates an AMA record 310 for the call. The

AMA record is passed to a billing analysis system 312 which applies customer specific parameters to the AMA record to produce a processed AMA record. The AMA record and processed AMA record are then passed to a CDD 308 for storage.

Detailed Description Text (24):
FIG. 4 shows another embodiment of a telephone system in accordance with the present invention. The customer profiles are not shown, but are similar to those shown in FIG. 1b. In the FIG. 4 embodiment, as in the previous embodiments, a call initiated at a first telephone 402 may be directed to a second telephone 404 through a network switch 406, which generates an AMA record 410. However, in the FIG. 4 embodiment the AMA record is passed to a Rating Complex (RC) 412. The RC is a unit which performs the functions of the CDD and billing analysis system, and may therefore be characterized as a combined CDD and billing analysis system. As shown in the figure, the RC may include a SD 413 for storing the summary information separately from the AMA records and processed AMA records. As in the prior described embodiments, alternative schemes may be employed for the storage of the AMA records, processed AMA records, and summary information.

Detailed Description Text (25):
It should be noted that although all three embodiments discussed above depict a call as being initiated from a first telephone and directed to a second telephone, it is possible that calls may be initiated by, and directed to, many different types of communication devices. For example, a call may be initiated by a fax machine and directed to a personal computer. Moreover, a call may be initiated by a single communication device and directed to multiple communication devices. For example, a call may be initiated by a fax machine and directed to multiple independent personal computers. For purposes of this description, each instance of a single initiating call being directed to a different terminating device will be considered an independent call.

CLAIMS:

1. A method of pricing a call made over a network by a customer of the network, comprising the steps of:

storing information specifying a billing plan of the customer and information specifying a plurality of telephone lines to which the billing plan applies, each telephone line having a separate billing account;

receiving a call made from one of the plurality of telephone lines at a network switch;

generating a record that describes the call;

receiving the record at a billing analysis system; and

determining a priced call value for the call based on the record, information specifying the customer billing plan and aggregated information relating to all of the plurality of separate billing accounts.

2. The method of claim 1, wherein the record that describes the call comprises an identifier of the telephone line from which the call was made and the determining step comprises the step of:

accessing the information specifying the customer billing plan using the identifier in the received record.

4. The method of claim 3, wherein the priced call value incorporates one or more discounts to which the customer is entitled.

5. The method of claim 1, wherein at least one of the telephone lines is geographically separate from the other telephone lines.

6. The method of claim 1, wherein each telephone line is coupled to a network switch and all telephone lines are coupled to the same network switch.

7. The method of claim 1, wherein each telephone line is coupled to one of a plurality of network switches and at least some of the telephone lines are coupled to different network switches.

9. A system for pricing a call made over a network by a customer of the network, comprising the steps of:

a database storing information specifying a billing plan of the customer and information specifying a plurality of telephone lines to which the billing plan applies, each telephone line having a separate billing account;

a network switch receiving a call made from one of the plurality of telephone lines and generating a record that describes the call; and

a billing analysis system receiving the record and determining a priced call value for the call based on the record and the information specifying the customer billing plan and aggregated information relating to all of the plurality of separate billing accounts.

10. The system of claim 9, wherein the record that describes the call comprises an identifier of the telephone line from which the call was made and the billing analysis system further:

accesses the information specifying the customer billing plan using the identifier in the received record.

12. The system of claim 11, wherein the priced call value incorporates one or more discounts to which the customer is entitled.

13. The method of claim 9, wherein at least one of the telephone lines is geographically separate from the other telephone lines.

14. The method of claim 9, wherein each telephone line is coupled to a network switch and all telephone lines are coupled to the same network switch.

15. The method of claim 9, wherein each telephone line is coupled to one of a plurality of network switches and at least some of the telephone lines are coupled to different network switches.

17. A system for pricing a call made over a network by a customer of the network, comprising:

means for storing information specifying a billing plan of the customer and information specifying a plurality of telephone lines to which the billing plan applies, each telephone line having a separate billing account;

means for receiving a call made from one of the plurality of telephone lines;

means for generating a record that describes the call; and

means for determining a priced call value for the call based on the record and the information specifying the customer billing plan and aggregated information relating to all of the plurality of separate billing accounts.

18. The system of claim 17, wherein the record that describes the call comprises an identifier of the telephone line from which the call was made and the determining means comprises:

means for accessing the information specifying the customer billing plan using the identifier in the received record.

20. The system of claim 19, wherein the priced call value incorporates one or more discounts to which the customer is entitled.

21. The method of claim 17, wherein at least one of the telephone lines is geographically separate from the other telephone lines.

22. The method of claim 17, wherein each telephone line is coupled to a network switch and all telephone lines are coupled to the same network switch.

23. The method of claim 17, wherein each telephone line is coupled to one of a plurality of network switches and at least some of the telephone lines are coupled to different network switches.